

ADVANCED TRANSPORTATION SYSTEMS

HEARING

BEFORE THE

SUBCOMMITTEE ON SURFACE TRANSPORTATION

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION

UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

ADVANCED TRANSPORTATION SYSTEMS: MAGNETICALLY LEVITATED
TRANSPORTATION AND HIGH SPEED RAIL

OCTOBER 17, 1989

Printed for the use of the
Committee on Commerce, Science, and Transportation

U.S. GOVERNMENT PRINTING OFFICE

24-024 O

WASHINGTON : 1989

5261-14

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ADVANCED TRANSPORTATION SYSTEMS

TUESDAY, OCTOBER 17, 1989

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
SUBCOMMITTEE ON SURFACE TRANSPORTATION,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:35 a.m., in room SR-253, Hon. J. James Exon (chairman of the subcommittee) presiding.

Staff members assigned to this hearing: Sheryl Webber Washington, professional staff member; Robert Holleyman, staff counsel; and Gerri Hall, minority professional staff member.

OPENING STATEMENT BY SENATOR EXON

Senator EXON. The subcommittee will please come to order.

This morning, the Surface Transportation Subcommittee is holding a hearing on the subject, Advanced Transportation Systems: Magnetically Levitated Transportation and High Speed Rail.

This is an exciting new concept. It is very important that we get on top of it. I called this hearing because I believe that high speed ground transportation is an area in which the United States needs to reassert its technological advancement and prowess.

As those of you familiar with the Mag-Lev technology know, U.S. scientists pioneered Mag-Lev technology in the 1960's and 1970's. Since that time, Japan and Germany have been leaders in the field and how many other areas that we can think of off-hand where American-developed technology has been set to one side and somebody else takes over?

Today, we hope to explore a number of the critical issues that must be addressed if the United States is going to reassert its leadership in this area, and we hope it will.

These issues include ways in which the development of a high speed system in the United States can yield major benefits, the cost and risk associated with that development, whether Federal or state funding is necessary and whether there is a need for legislation to facilitate development or eliminate barriers to construction of the systems, given the burdens placed on many of our existing transportation arteries.

I am enthusiastic about the projected ability of high speed rail and Mag-Lev systems to enhance U.S. mobility and relieve our congested airways and highways.

Finally, the members of the Senate, and particularly the members of this Committee, also have a keen obligation, in my view, to

help ensure that adequate safety standards are being considered in the design of these systems.

In planning for this morning's hearing it has been evident that the issue of high speed transportation is one of the tremendously important issues, both to the states, to industry, and the scientific research community.

We had more requests to testify than our schedule this morning could accommodate, for which reason a number of interested parties are submitting testimony for the record. I believe, however, that in scheduling witnesses to appear at today's hearing, we have assembled a group of professionals who should be able to provide us with a broad overview of the issues to be addressed as we look toward the development of high speed transportation systems in this country.

Our first witness is my fine colleague and friend from Nevada, Senator Harry Reid, who has a special interest in this technology as efforts are underway in his state to build a high speed system.

We also will hear from the Federal Railroad Administrator, Gil Carmichael, who indicated during his confirmation hearing that the development of high speed transportation systems would be a personal priority during his administration as well as a priority for the Department of Transportation during the coming year.

We will also hear from a distinguished panel of witnesses that include Mr. Paul Reistrup, Chairman of the High Speed Rail Association, and I might add a former Chairman of the Amtrak Board, Assemblyman Richard Katz, Chairman of the California-Nevada Super Speed Train Commission, and Dr. Richard Uher, Director of the High Speed Ground Transportation System at Carnegie Mellon University.

I thank all of you for being here, and I assume there are no opening statements. Senator Bryan, do you have any opening statement?

OPENING STATEMENT BY SENATOR BRYAN

Senator BRYAN. Mr. Chairman. I commend you for holding these hearings to review the state of advanced ground transportation systems in the United States.

I am proud that the State of Nevada is a pioneer in the implementation of these new systems. As Governor, I signed into law legislation to approve the Nevada half of the California-Nevada Super Speed Train Commission. The purpose of the Commission is to oversee the introduction of a high-speed train—which is financed completely with private funds—from Las Vegas to numerous points in Southern California. I am pleased that the Chairman of that Commission, Mr. Richard Katz, will be testifying today to review the progress of the project.

In addition, the local authorities in Southern Nevada are evaluating proposals to deploy magnetic levitation technology for local transportation.

These new trains employ exciting new technologies which are designed to address some of our most pressing transportation needs. Proponents note that these trains will help relieve congestion on our heavily travelled interstates, such as between Washington and

New York, and provide a convenient alternative to air transportation on medium length trips, such as between Las Vegas and Southern California. In addition, such trains will help reduce our energy consumption—and our need for foreign oil—and reduce the pollutants spewed into the atmosphere by substituting electricity for polluting automobile engines.

According to a study by the California-Nevada Super Speed Train Commission, the first super-speed train project would eliminate at least 33 million vehicle-miles of automobile travel, reducing energy required for travel in the corridor by 18 percent.

Mr. Chairman, a fast, reasonably-priced rail transportation alternative may not only help address the problems of our congested highways, but it should also reduce congestion at our airports and in our airways. And, I should add, it may prove to be a needed measure of competition for an airline industry with less and less competition.

These are new transportation alternatives and the purpose of today's hearing is to help us separate fact from fiction. I hope today's hearing will also give us a better understanding of the potential benefits—as well as the potential drawbacks and costs—and whether we in Congress should be doing more to facilitate this new technology.

Congress already took one important step last year to put "high speed, intercity rail facilities" in the same favored tax status as airports, mass transit facilities, and other transportation facilities exempting them from federal tax on revenue received on bonds. Another important—indeed critical—step would be to allow the use of rights-of-way along Federal-aid highways, most notably the Interstate Highway System. Senator Moynihan has introduced legislation, S. 221, which I have cosponsored, which would accomplish this goal.

If—as I believe—these new trains will serve an important transportation need well into the next century, another critical question is who will build these trains. Unfortunately, Mr. Chairman, this is another area where the United States was an early leader in the development of the technology, but relinquished that lead to other countries, most notably West Germany and Japan. Mr. Chairman, we must not concede this technology—as we have so many others—to our industrial competitors. I look forward to working with you and other members of the Committee and the Senate to facilitate the deployment of these new transportation systems, and to assure that we are doing all we can to make sure that American firms are designing, building and engineering them.

Senator EXON. Thank you very much, Senator Bryan.

I have an opening statement that the chairman, Senator Hollings, would like to have included in the record.

[The statement follows:]

OPENING STATEMENT BY THE CHAIRMAN

I would like to take this opportunity to thank our distinguished panel for appearing here today to testify on this important issue. As we move into the last decade of this century this nation faces a crisis in its transportation system.

Our highways are so congested that many resemble parking lots, air travel, once the fastest and most convenient mode of transportation is beset with delays. There

are many who believe that the development of magnetic levitation and high speed rail systems will help to ease the burden on both our highways and airways.

Maglev is technology that was developed in the United States, yet as is the sad story of many of our technological advances, it is the German and Japanese that have taken the lead in and perfected this technology. I believe that it is incumbent upon us to assist the development of this new technology and restore the American industry's competitive edge. Today's hearing should help us better assess what is needed in the effort to prepare for our nation's critical transportation needs in the 1990's and the century to come.

Senator EXON. Senator Reid, we are very delighted to have you here this morning. You have been a leader in this area and the Committee is very interested in your views. You please proceed in any fashion that you feel is appropriate.

STATEMENT OF HON. HARRY REID, U.S. SENATOR FROM NEVADA

Senator REID. Mr. Chairman, Senator Bryan, I thank you for allowing me the opportunity to be here this morning.

I personally believe that the next world-wide technology revolution will be in advanced technologies—from advanced ceramics and high-tech defense products to superconductivity.

In the 19th Century we had the railroads and the telegraph. In the beginning part of this century, we had the factories and oil fields, but to remain a world-class power in the 21st Century we must take the lead, and take it now, in all of the new advanced technologies, including the one known as magnetic levitation.

I personally applaud your efforts to survey public and private steps to make Mag-Lev technology a reality in this Nation. But if our Nation is to have a Mag-Lev industry of its own, the Federal Government must take the lead. Mag-Lev technology needs and deserves Federal help and it deserves it today.

We know the technology works. It has worked ever since it was invented by two American scientists at MIT in 1971; and how it was invented, Mr. Chairman, I think portrays the American mind. These two scientists were stuck in traffic and they decided to come up with some way to avoid the traffic jam they were in. They have testified on at least two separate occasions before the Environment and Public Works Subcommittee and they are most interesting, to say the least. We know this technology works, because railroads, airlines and the automobile industry are terrified this advanced technology will reduce the need for their traditional technologies. And finally, we know it works without polluting the environment.

Mr. Chairman, Mag-Lev technology works and it will be used in the United States. We must accept that. The problem is, it may not work for us. The Japanese and Germans took the ideas and theories of our scientists and turned them into working machines. We have the pride of authorship, but no longer the pride of ownership.

The story of Mag-Lev technology in our country would be like prehistoric humans inventing the wheel and discovering fire and then giving it all away because they were too lazy to act on their own ingenuity.

The new magnetic levitation technology may not be built by American corporations. The market will not provide an environment conducive to the long-term financial commitment necessary to develop Mag-Lev technology domestically. Research and develop-

ment costs, construction costs and the probable rate of return will never satisfy managers trying to maximize profits for shareholders.

If for no other reason than to minimize a long-term risk for private industry, the Federal Government must play a role in the development of this Mag-Lev technology.

Congress has already taken steps to make Mag-Lev more attractive to investors. Section 6180 of the Technical and Miscellaneous Revenue Act of 1988 provides tax-exempt treatment on the interest of bonds issued to finance high speed rail facilities. Our fellow senator and Mag-Lev enthusiast, Senator Moynihan, and I introduced legislation in the 101st Congress, S. 221, permitting the construction of Mag-Lev routes on the rights-of-way along Federal aid highways—basically down freeways—and I will soon introduce legislation providing a Federal guarantee for the investment of public funds in the construction of Mag-Lev facilities.

All of these bills make investments into Mag-Lev much more attractive at minimal cost to the Federal Government. Precisely this type of climate is needed to attract private industry today, into this technology of a not-so-far-distant future. But these incentives are not enough.

We are in a race with Japan and Western Europe to see who will be the leader in a variety of technologies. This race is going on as we speak, and if we are going to win any of these competitions, we must enter these competitions today. You cannot win if you do not enter.

One of the witnesses who will shortly address the Subcommittee is Richard Katz, Chairman of the California-Nevada Super Speed Ground Transportation Commission. This commission is coordinating the development of a Mag-Lev route between Las Vegas and Los Angeles.

I have spoken to Assemblyman Katz and he has a vision of what the future of the transportation system of this country will be. Completion of the project between Las Vegas and Los Angeles will enable passengers who travel from Las Vegas to Los Angeles—and I say Los Angeles because it has not been determined whether it will be Anaheim or Los Angeles, but between Las Vegas and California—a distance of about 230 miles, in about an hour.

This project has made substantial progress since it was conceived in the 1960's and is now the most advanced of any of the other proposed routes. The commission must now decide whether to use the West German technology or the Japanese technology. This commission will not even take a look at American technology, because there is not any available.

Congress has taken several very, very small steps, but they have been steps, to directly aid the development of a domestic Mag-Lev train industry. The fiscal year 1990 Energy and Water Development Appropriations Bill, which has been signed by the President, includes \$1 million for the Army Corps of Engineers to establish a research and development plan for Mag-Lev technology.

The results of this research and development will be utilized by private industry to produce Mag-Lev technology that leapfrogs our competitors. This direct investment is necessary if the United States is to have a domestic Mag-Lev industry.

Chairman Exon, in 1843, the Federal Government took a chance. It provided money to construct a telegraph line from the City of Washington, D.C. to Baltimore in order to test this then new technology. This small investment eventually resulted in the creation of a telecommunications industry that is the most advanced in the world, employs hundreds of thousands of people and contributes billions of dollars to this Nation's gross national product. I am convinced a small investment today in Mag-Lev technology will ensure similar returns for tomorrow.

I appreciate very much the opportunity to appear before you, and I am grateful your Subcommittee is taking an interest in this most interesting technology.

Senator EXON. Senator Reid, thank you very much, and I am not only pleased you came here to testify, but I am pleased that you are on record in our Subcommittee, which will be studying and leading in the effort, with the help of you and others, to try and get the United States at least moving to know more about the feasibility of this project than we have done for a long time.

It is exciting to hear how far along you are in cooperation with Nevada and your big neighbor to the West, with regard to developing something like this, and when you offer and suggest something and put it in the context of an hour between Las Vegas and Los Angeles, it quickly inspires one to thinking that there are things that we can still do that would make an awful lot of sense.

I am very pleased to call on a recently confirmed member of the administration, the Honorable Gilbert E. Carmichael, of the Federal Railroad Administration.

Mr. Carmichael, if you would come forth now. And while you are approaching the table, I wish to congratulate you for the way that you moved in with great dispatch into your new important assignment having only recently been confirmed through this committee and confirmed by the United States Senate. You have taken charge of things over there, Mr. Carmichael, and we especially appreciate your being here today to give us your views from your important vantage point in the administration as to what you think of this technology, and what your recommendations are for the future.

So I would say that your full statement that you have prepared will be entered into the record at this time without objection. And I would ask you to proceed in any fashion that you would wish.

**STATEMENT OF HON. GILBERT E. CARMICHAEL,
ADMINISTRATOR, FEDERAL RAILROAD ADMINISTRATION**

Mr. CARMICHAEL. Mr. Chairman, it is a pleasure to be here. And you have been very kind to me the first time that I appeared in this room. And those memories are fond, and I hope that I will do a decent job today and that we will have a good rapport in our presentation. So to you, and to the distinguished members and to the staff, it is my privilege to appear before this subcommittee to testify on the development of the high speed rail and magnetic levitated transportation in the United States. And those are two different animals, high speed and magnetic levitated systems. So I hope to try to distinguish between them.

I have two of my associates with me today. On my right is Mr. Jim McQueen, who is the associate administrator for passenger and freight. We are kind of giving him a new title and we are beginning to realize as time moves on and events occur right now, that he may be the railroad development associate administrator, as this technology takes place. On my left is Bob Krick, who is director of research and development, FRA. And I would like to point out it is a very hard working group of 15 people for research and development.

The other day, I had the chance to be in Russia, and to look at their system and to sign an agreement for swapping technology. And their research and development man said they had 4,000 people in their department. I, too, believe that our 15 people over here are doing some great work to match anything they are doing over there. So it is a very big pleasure to be here. I have a short version of that longer presentation that I am going to just flip through it and pick out some of the key pieces, because I want to present the overview of FRA, the Federal Railroad Administration. And I want the railroad and the Federal Railroad Administration to be a leader in moving these projects that we are talking about. The implementation, to implementation and I am pleased that my first appearance as a witness in my term as Federal Railroad Administrator is on a subject on which I have a great deal of personal interest, and where I believe the FRA can make a real difference in the last decade of this century.

We have got quite a transportation system out there right now, that has got some flaws in it. With some adjustments it could be, and not only is it a great transportation system, but it can be a very good transportation system. In the quality of life and movement of people, modern high speed rail systems, conventional railroad technology, with steel on steel, has been engineered to produce speeds up to 200 miles per hour. And with Mag-Lev, we have a totally different and new technology where magnetic forces support or suspend the vehicle above the guideway, providing a contact-less, friction-free system with speeds up to 300 miles an hour.

Some of the engineers have told me that the system, once on motion could go up to 1,700 miles an hour, but the human-being may not be very comfortable. So it has got that kind of potential. There are two types of Mag systems. And we have got these two pictures here illustrated. The German Transrapid system, I believe that is this one over here. The German Transrapid system works on the magnetic attraction principle where the vehicle underframe, which wraps around the top of the guideway, you can see the guideway there, and see how it wraps around it, is drawn up.

Senator EXON. That is wrapped around on each side?

Mr. CARMICHAEL. That is right. And when it is activated it is pulled up to within about three-eighths of an inch of the bottom surface of the guideway. And then it is levitated and moves. The second, the Japanese rail system, that you see over on this side, works on a repulsion principle where it is actually sitting and pushing the vehicle four to six inches away from the guideway so that it sits on the guideway and is repulsed from it. And so you

have one that is attracted and one that is repulsed. Two very significant different types of Mag-Lev systems.

None of them is in revenue service. Although the Germans and the Japanese have spent—the Germans, I think, have spent about \$1 billion and the Japanese have spent almost \$1 billion themselves in developing prototypes that have carried passengers on test runs. As has been stated earlier, we were one of the world's leaders in Mag-Lev research and development through the mid-1970's. In fact, this technology is about 20 years old. From the research time, there is no magnetic levitated development in the United States at this time. There is, however, considerable interest in the use of the Mag-Lev system in the State of Florida.

Florida has begun a process that may start construction. And this is what when I came on board kind of shook me up. I got here and I found out that they were in the process of practically awarding a contract in the Mag-Lev system in Florida, could be under construction as early as next year.

Just as a quick brief history of FRA's involvement. It was created under the High Speed Ground Transportation Act of 1965; the Department of Transportation ran research programs, in high speed ground transportation, and a demonstration program involving Metroliner and turbo trains. Back in this period the demonstration showed that improved railroad trip time between cities like Boston and New York, or Washington in the northeast corridor, would attract a multitude of passengers to the railroads.

We undertook the northeast corridor improvement project as you are well aware of in 1976, and invested over \$2.3 billion to improve the rail system. It is that project carried out by FRA, the Federal Highway Administration and Amtrak in cooperation with the state and local governments, which resulted in a two hour and 30 minute run between here and New York City on the Metroliner service, which is running at about 125 miles an hour, which is a high speed rail service.

FRA has been involved in research and development covering the full range of high speed rail in Mag-Lev transportation from 1965 to 1975 were a leader in research on the linear induction motor. This was referred to a while ago when we did our early research. The linear induction motors, we produced a research test vehicle that reached 255 miles per hour. FRA Mag-Lev research has produced scale model demonstrations when the program was terminated in 1976. We have, FRA has completed research study of available high speed trains worldwide. Our small staff has been doing its homework, Mr. Chairman.

The Japanese bullet train, France's TGV and Italy's Pendolino, and Germany's ICE trains have all been checked and inspected. The FRA continues working with the states considering high speed rail and Mag-Lev systems. As you hear a minute ago, the Nevada case, FRA has been a catalyst in providing for these efforts, initial seed money and technical assistance has been given to them. Prominent to the other projects, besides Nevada and California, are Ohio, Texas and Florida itself.

The main focus of this hearing is that as we understand it, is on advanced technology. I would like to make the observation that there are several corridors where different approach has been

taken. In these areas, Amtrak already offers multiple frequency service. And there is a potential for considerable speed improvements on the existing tracks for high speed steel on steel rail service. And there is already a substantial ridership base in which to build. So, I want us to keep that in mind as we look at this whole new technology. I believe this approach is as beneficial in certain circumstances as the approach involving new right of ways, and the old should be considered and encouraged too.

We are working with several states right now to develop high speed rail in the Mag system. We share belief that these states and the private sector that is safe internodal high speed rail and Mag-Lev systems have enormous potential for reducing highway and airport congestion. At speeds up to 300 miles per hour such systems can be especially attractive as alternatives to air and auto trips of between 160- and 600-mile distances.

I ask us all to just stop a second and imagine the impact on airport and high way congestion. If a Mag-Lev system connected Los Angeles and San Francisco, FRA is working to stimulate the development of these systems and recently restarted, as I said when I got here, restarted our Mag-Lev research efforts. We are doing—we have a wealth of information and we going back and opening up our library and we are doing a study of the feasibility of commercial Mag-Lev in the United States, at the direction right now, of the Congressional Appropriations Committees. That study will be finished in June of 1990, just about eight or nine months from now. And it will evaluate the market potential and assess the technical feasibility of the commercial Mag-Lev systems, assess the capability of U.S. industry to develop such systems, and identify the legislative and other institutional changes that would facilitate the development of U.S. design and manufactured Mag-Lev systems.

Speaking to what Senator Reid was requesting a while ago, his committee has positioned FRA in a leadership role in what I call a significant rail safety improvement act of 1988. Congress specifically defined railroads to clarify FRA's authority to set and enforce safety standards that are applicable to the Mag-Lev technologies. As the agency responsible for the safety of intercity and high speed rail and Mag-Lev systems, we have initiated a major research effort to provide this basis for safety standards. If they are going to build one in Florida, we have to have our safety standards on stream immediately and concurrently. The Florida High Speed Rail Commission has notified FRA of its intent to award this contract to construct the German Transrapid system at Orlando, Florida to the possible Disney World site.

As I said a while ago, with the construction beginning as early as 1990, research on the German Mag-Lev system is underway and will be accelerated to ensure that unresolved concerns with safety do not slow implementation. I do not want FRA to be in hindrance. I want the FRA to be a stimulant. This work will evaluate the adequacy of existing German standards covering the Mag-Lev system. They have a system in Germany kind of like our U.L. Laboratory testing over here. FRA is checking their procedures for their safety to see how it complies with our safety procedures.

FRA's initial research focuses on the German Mag-Lev system. But we also intend to cover repulsive levitation as represented by

the Japanese design. Our first priority in these efforts is safety and we are working with the developers of these systems to ensure that FRA safety standards and regulations are clear. As I said a minute ago, so that they do not slow down the process.

Now this is an important area that we have heard from other areas, people interested in the Mag-Lev system. We are exploring the use of existing transportation rights of ways, such as the interstate highway system and the freight rail lines themselves. Preliminary assessments by the Federal Highway Administration have indicated that the location of the Mag-Lev systems in interstate system median strips may not be technically feasible in certain corridors, because of the horizontal curvature limitations. These high-speed-trains have got—they are very sensitive to fast turns and curves, or big curves. However, we will continue to work with the Federal Highway Administration, the states and other parties to explore mechanisms for expediting the requisite approvals to where highway segments can be used in such a project.

Other highway related concerns involve grade crossings, when we go back to high speed rail. On those projects, plainly if you want high speed rail in the United States, sir, there should not be any grade crosses. We are also exploring options for addressing the grade crossing issues with the Federal Highway Administration. There is a good rapport developing between Mr. Larson and myself, who is a Federal Highway Administrator.

I will try to summarize quickly on this. The future of high speed rail and Mag-Lev in the United States will depend on a number of factors. As you know Secretary Skinner has announced that the National Transportation policy will be available by, hopefully, in January. I cannot at this time comment on how high speed rail and Mag-Lev would be treated in this policy, but I am doing my best to influence it. I can discuss that some of our thoughts and observations to date. We share a concern among a wide spectrum of citizen about the extent, and this is the outside forces that are helping move this technology, the air and highway congestion are building considerably, and that is making this technology look even better. And we are looking for ways to provide alternatives that are less disruptive and possibly less expensive than the constructions of new highways and airport facilities.

I believe there is a bright and promising future for high speed rail and Mag-Lev in the United States, as I said in my earlier testimony. With a steady increase in intercity travel and concerns of worsening air pollution and congestion on the highways and the airports, these systems, I believe I can predict, will be built in the United States within this next decade. It is my belief that high speed rail and Mag-Lev project should be developed by the private sector where they are subjected to the scrutiny of the marketplace. Preliminary evidence from prior studies suggests that there is a U.S. market for these projects, and that they will meet the financial standards of the investors.

I will point quickly to the project in Florida. Private investors are financing that Mag-Lev project. It is a 17-mile system proposed from Orlando airport out to the EPCOT Center, in the Disney World area. To be 17 miles long, it cost about \$600 million. They will charge them \$12 to ride 7 minutes at 250 miles an hour. Now

that is a great treat for people coming down to the Disney World complex. But that is one of the smartest sales places to put a technology, if you want to merchandise it that you can imagine anywhere in the world. Millions of people will see that technology and go home. So what that is, what the Germans are doing down there, is building a sales model the Germans and the Japanese together building a sales model for this technology.

Now let me finish with this one point. I believe that the Department of Transportation using the resources of FRA and using FRA, can induce the private sector to do the job with private funds. FRA's primary responsibility is to ensure the safety of these new technologies. However, FRA can also stimulate American firms to develop the Mag-Lev system. We can be the innovative part of this thing. We can do first the assessment of the market potential of the Mag-Lev systems in specific travel markets. Second in assessing the technical issues in the development of an improved American system, the research part of this has been done, Mr. Chairman. It is now at the development stage of it. And preparing prospectuses, and this kind of throws people a little bit, but I think FRA can help prepare prospectuses for individual Mag-Lev projects explaining the projected revenues and cost of the projects. Sources of public and private financing, availability of right of way, and other similar information needed to induce the participation of the manufacturers in the United States and the financiers in the world.

I believe the private sector will move rapidly and efficiently given the market stimulation that FRA is prepared to provide.

Mr. Chairman, I apologize for going into that short version in detail, but it is so important to the Federal Railroad Administration.

[The statement and questions and answers follow:]

**TESTIMONY OF GILBERT E. CARMICHAEL
FEDERAL RAILROAD ADMINISTRATOR**

It is my privilege to appear before this Subcommittee to testify on the development of high speed rail and magnetically levitated (maglev) transportation systems in the United States. I believe that these technologies have the potential to bring enormous benefits to our citizens and I want the Federal Railroad Administration to be a positive stimulus in moving these projects to implementation. I am pleased that my first appearance as a witness in my term as Federal Railroad Administrator is on a subject in which I have a great deal of personal interest and where I believe this Administration can make a real difference.

In modern high speed rail systems, conventional railroad technology--i.e., steel wheel on steel rail--has been engineered to produce speeds of up to 200 m.p.h. in regular service. The recently introduced French TGV--Train à Grande Vitesse--has a maximum cruising speed of 187 m.p.h., but it has been tested at well above 200 m.p.h. With maglev, we have a totally different and new technology where magnetic forces support or suspend the vehicle above the guideway providing a contactless system with speeds up to 300 m.p.h. Magnetic forces provide levitation, guidance, propulsion and braking.

Maglev systems are designed around the principle that opposite magnetic poles attract and like poles repel. This principle is illustrated by the two types of maglev systems being tested today. The German Transrapid system works on the attraction principle where the vehicle underframe, which wraps around the top of the guideway, is drawn up to within three-eighths of an inch of the bottom surface of the guideway. The second, the Japanese Railway's System works on the repulsion principle, pushing the vehicle 4-6 inches away from the guideway.

No maglev system is in revenue service, although the German and Japanese have spent at least a billion dollars each developing prototypes which have carried passengers on test runs. While we were a world leader in maglev research and development through the mid 1970's, there is no maglev development in the United States at this time. There is, however, considerable interest in the use of maglev systems, and the State of Florida has begun a process that may start construction of a maglev line using the German Transrapid system as early as 1990.

Today, I will briefly outline FRA's involvement in the development of high speed rail and maglev systems in the United States and summarize my views on how we might act as a catalyst to spur future development of these systems.

Involvement of the Federal Railroad Administration

Let me start by reviewing the long-standing and deep involvement of the Federal Railroad Administration (FRA) in high speed rail and maglev. The earliest involvement dates from the High Speed Ground Transportation Act, which actually preceded the creation of the Department of Transportation. Under that Act, the Department of Transportation ran a research program in high speed ground transportation and a demonstration program involving the Metroliner and the Turbo Train. The demonstrations showed that improved railroad trip times between cities in the Boston-Washington Northeast Corridor would attract passengers to the railroad. The Department, under the same Act, undertook a planning exercise to determine the best form of transportation to emphasize for passenger movement in the Northeast Corridor. This eventually led to the Northeast Corridor Improvement Project in 1976 which has invested over \$2.3 billion in improved rail transportation. It is that project, carried out by FRA, Federal Highway Administration, and Amtrak in cooperation with State and local governments, which has resulted in the 2-hour and 30-minute, 125 m.p.h. Metroliner service from the Washington area to New York that we know today.

FRA has been involved in research and development covering the full range of modern high speed rail and maglev transportation systems. I will briefly summarize some of our activities, beginning with the earliest projects.

- o From 1967 through 1975, FRA's Office of High Speed Ground Transportation was a world leader in research on linear induction motors and maglev. In 1974, a prototype linear induction motor research vehicle produced from this research set a world speed record of 255.4 m.p.h. FRA maglev research had produced scale model demonstrations when the program was terminated in 1976.

- o FRA recently completed a research study of available high speed trains world-wide to identify the safety implications of operating these foreign systems in the U.S. The study covered all of the available high speed rail systems, including:
 - 1. Japan's Shinkansen, which operates on entirely separate right-of-way and runs at a top speed of 150 m.p.h. This service has been running accident free since 1964. On the Tokyo-Osaka segment, it provides an enormous transportation capacity of 15 car trains every 6 minutes in each direction.

 - 2. France's TGV, in operation since 1981. The newest segment, the Atlantique, reaches 187 m.p.h. The French concept is to run these trains on separate rights-of-way to attain the top speeds but to use lower speed existing tracks shared with conventional trains to

penetrate Paris and other cities and to reach outlying sections of the country.

3. Italy's Pendolino which reaches 150 m.p.h. on separate right-of-way and also operates on existing trackage at lower speeds. It has been running over a year. As the name suggests, it tilts on curves to compensate for the side thrust on passengers and thus it can go around curves faster than a normal train.
 4. Germany's recently developed Inter City Express (ICE) train which is capable of the same speeds as the TGV's, though the new high speed line on which it is to run will not be open to service until 1990 or 1991. The Germans are planning still another variation of service. They plan to run some freight trains on the same new high speed line.
- o FRA continues working with States considering high speed rail and maglev systems. FRA has been the catalyst for these efforts, providing initial seed money and technical assistance for each. Prominent among these projects are--
1. **Florida** - FRA provided the seed money for the feasibility study and is acting as lead agency for environmental review. That initial feasibility study

has spawned both a high speed rail project and the first high speed maglev project in the U.S.

2. **Texas** - FRA provided the seed money which, along with an equal amount of State money, financed the high speed rail feasibility study. FRA worked closely with the Governor's office to resolve institutional issues which had stalled the study. This study focused on conventional high speed rail.
3. **California/Nevada** - FRA provided the seed money and acted as technical advisor in the early stages of the feasibility study. This study considered both maglev and high speed rail.
4. **Ohio** - FRA provided a portion of funding for a feasibility study. The State has completed preliminary engineering, market research, and financial feasibility studies.

In each of these cases, the States created separate commissions charged with selection of private high speed rail or maglev projects.

Though the main focus of this hearing is on advanced technology, I would like to make the observation that there are several corridors where a different approach has been taken. Instead of

proposing entirely new rights-of-way, the States served by these corridors have made or have expressed an interest in making considerable investments in incremental improvements to existing rail lines. These include the Boston-New York portion of the Northeast Corridor, the San Diego-Los Angeles Corridor, the New York-Albany-Buffalo Corridor, and the Chicago-Detroit Corridor. In these areas, Amtrak already offers multiple frequency service, there is potential for considerable speed improvements, and there is already a substantial ridership base on which to build. I mention this because I believe that this approach is as beneficial in certain circumstances as the approach involving new rights-of-way and should also be encouraged.

Current High Speed Rail and Maglev Activities

Currently, FRA is working with several States attempting to develop high speed rail and maglev systems. We share a belief with these States and the private sector that safe, intermodal high speed rail and maglev systems have enormous potential for reducing highway and airport congestion. At speeds up to 300 m.p.h., such systems can be especially attractive as alternatives to air and auto trips of 100-600 miles in length. Imagine the impact on airport and highway congestion if a maglev system connected Los Angeles, San Francisco, Sacramento and Las Vegas or a high speed rail system connected Boston and New York City.

FRA is working to stimulate the development of these systems and recently, restarted our maglev research efforts. We are doing a study of the feasibility of commercial maglev in the U.S. at the direction of the Congressional Appropriations Committees. That study, scheduled for completion in June 1990, will include a preliminary market assessment, will assess the technical feasibility of commercial maglev systems and the capacity of U.S. industry to develop such systems, and will identify legislative and other institutional changes that would facilitate the development of U.S.-designed maglev systems.

This Committee has positioned FRA in a leadership role in the development of high speed rail and maglev and we welcome that role. In the Rail Safety Improvement Act of 1988, Congress specifically defined "railroads" to clarify FRA's authority to set and enforce safety standards that are applicable to these technologies. As the agency responsible for the safety of intercity high speed rail and maglev systems, we have initiated a major research effort to provide the basis for safety standards. The Florida High Speed Rail Transportation Commission has notified FRA that it has awarded a franchise to construct and operate the German Transrapid maglev system from the Orlando Airport to a possible Disney World site, with construction beginning as early as 1990. Research on the German maglev system is underway and will be accelerated to insure that unresolved concerns with safety do not slow implementation. This work will

evaluate the adequacy of the existing German standards covering this maglev system, the compliance of the system with the German standards, and the need for additional standards for operation in the U.S. Our goal is to have safety requirements in place before the design is finalized. FRA's initial research focuses on the German maglev system, but we also intend to cover repulsive levitation as represented by the Japanese design. Our first priority in these efforts is safety, and we are working with the developers of these systems to ensure that FRA safety standards and regulations are clear and timely so that they may be considered in system design. We want safety to be built into the systems, not added later as is the case in some projects.

We are exploring the use of existing transportation rights-of-way, such as the Interstate Highway System and freight rail lines. Preliminary assessments by the Federal Highway Administration have indicated that the location of maglev systems in Interstate System median strips may not be technically feasible in certain corridors because of horizontal curvature limitations. However, we will continue to work with the Federal Highway Administration, states and other parties to explore mechanisms for expediting the requisite approvals where highway segments can be used in a project. Another highway related concern involves grade crossings on high speed rail projects. Plainly, there should be none. We are also exploring options for addressing the grade crossing issue with the Federal Highway Administration.

FRA is also responding to requests from States for staff assistance on high speed rail and maglev projects. We are working with the Coalition of Northeastern Governors (CONEG) on an analysis of the viability of a high speed tilt-body service between Boston and New York City. Last year, FRA research tests established the operating feasibility of high speed tilt service and now we are assisting with the economic and financial analysis of the project.

National Transportation Policy

As you know, Secretary Skinner has announced that the National Transportation Policy will be available early next year. One of the main efforts in the writing of this policy has been consultation with and public hearings involving a wide range of interest groups and individuals. While I cannot at this time comment on how high speed rail and maglev will be treated in the policy, I can discuss some of our thoughts and observations to date. In particular, we share a concern, among a wide spectrum of citizens, about the extent to which air and highway congestion has been building, and we are looking for a way of providing alternatives that are less disruptive, and possibly less expensive, than the construction of new highway or airport facilities.

Future of High Speed Rail and Maglev

I believe that there is a bright and promising future for high speed rail and maglev in the United States. With the steady increase in intercity travel and concerns with worsening air pollution and congestion on highways and at airports, these systems will be built in the United States within the next decade. Florida has made an excellent beginning and has developed broad support for its high speed rail and maglev projects. We are equally optimistic about projects in Texas and Ohio, and the project from Las Vegas to Southern California.

It is my belief that high speed rail and maglev projects should be developed by the private sector where they are subjected to the scrutiny of the market place. Preliminary evidence from prior studies suggests that there is a U.S. market for these projects and that they will meet the financial standards of investors. A market for U.S. maglev projects also suggests an opportunity for U.S. industry to develop a design which would become the system of choice for areas considering maglev.

I believe that the Department of Transportation, using the resources of FRA, can induce the private sector to do the job with private funds. FRA's primary responsibility is to insure the safety of these new technologies. However, FRA can also stimulate American firms to develop maglev systems by (1)

assessing the market potential of maglev systems in specific travel markets, (2) assessing the technical issues in the development of an improved American maglev system, and (3) preparing prospectuses for individual maglev projects explaining the projected revenues and costs of the projects, sources of public and private financing, availability of rights-of-way, and other, similar information needed to induce the participation of manufacturers and financiers. In effect, FRA would take the lead in evaluating the marketplace potential and safety of a domestic maglev system by demonstrating to manufacturers, financiers, and state and local governments that an American maglev system is technically and economically feasible. Once an attractive investment opportunity is shown, we believe that private investment will rapidly follow. We have a clear choice -the private sector leading the way, or government trying to lead the way with a federally-sponsored prototype. I believe the private sector will move rapidly and efficiently, given the market stimulation we are prepared to provide.

QUESTIONS OF SENATOR BRYAN AND THE ANSWERS THERETO

1. Costs, Financing and Governmental Support.

QUESTION 1A: Could you estimate the relative cost of the various technologies, maglev vs. conventional technology?

ANSWER:

Costs of the various systems will vary depending on whether existing lines are upgraded for speeds around 125 m.p.h., or entirely new lines are constructed with speeds of 150 to 200 m.p.h. in the case of rail and up to 300 m.p.h. in the case of maglev.

The cost of upgrading existing lines to 125 m.p.h. will vary according to the extent of the rehabilitation. In the case of the Northeast Corridor, which received extensive rehabilitation, the cost came to about \$6 million/mile.

The cost of building new high speed rail lines has varied from \$10 million to \$40 million per mile, depending on terrain and design philosophy. At the low end of this range is the cost of France's TGV lines which involve very little earthwork, tunnels, or viaducts because they are built on France's gentle hills and can be designed for rather steep grades since they do not need to accommodate heavy freight and because they do not involve construction of new lines into urban centers. Proposals for high speed rail in the U.S. involve very little earthwork and no tunnels; consequently, construction costs have been projected under \$10 million per mile. At the high end are new lines in Japan and Germany which have many tunnels and structures because of the need to maintain shallow grades in rugged terrain and the need to build lines into urban centers.

There is much uncertainty about the cost of maglev because a commercial system has not yet been built. The Department will explore the issue of maglev costs in the report on the feasibility of commercial maglev systems which is due to the Congress in June of 1990. I would note that levitation of the vehicle means a longer service life for the guideway which accounts for about 80 percent of capital costs.

QUESTION 1B: Following up on the issue of costs, who are the leaders as far as cost, including financing, in this area: the Americans, the Japanese, or the various West Europeans?

ANSWER:

France, Germany, Italy, Spain, and Sweden have high speed rail technologies of interest to the U.S., as do Japan and Canada. All have lenders which appear willing to consider financing projects involving systems from their respective countries. There is no clear leader, as different systems offer advantages depending on the application. The U.S. does not have a company in the business of supplying high speed rail or maglev systems, though some U.S. investors have expressed interest in financing projects in the U.S. using foreign technology.

QUESTION 1C: What role do government subsidies play in European and Japanese development of this technology and the financing of these projects?

ANSWER:

European transportation systems have a long tradition of support from high fuel taxes. The transportation ministries in Europe directly sponsor research and development of new technology across all modes of transportation. For example, Germany's Ministry of Research and Technology has spent about \$1 billion on maglev development and has also been heavily involved in the development of the new German Intercity Express Train. Japan's government also has spent heavily on the development of maglev and high speed rail technology. The governments of Europe and Japan have also underwritten the subsequent construction of the lines and systems implementing the newly developed technologies.

2. State of Present Technology

QUESTION 2A. What are the present licensed and operating high-speed rail and maglev systems operating in the world today?

ANSWER:

The high speed rail systems operating today in revenue service include the Japanese Shinkansen or "bullet" trains which began 130 m.p.h. operation in 1964 and now reaches 150 m.p.h., the French TGV (Train A Grande Vitesse) which commenced high speed operation in 1981 and has achieved operating speeds of 187 m.p.h. on the newest line between Paris and LeMans, and the Italian Pendolino trains which began operating at 150 m.p.h. in 1988. In the 125 m.p.h. speed range, there are the Amtrak Metroliner service in the Northeast Corridor, the Spanish Talgo train, Britain's HST, and other conventional European trains. Nearing the end of the development cycle and soon to go into revenue service, are the German Inter City Express (ICE), with speeds up to 180 m.p.h. and the Swedish X-2, with speeds up to a 125 m.p.h. Of particular significance for the U.S. are the Talgo, Pendolino and X-2, tilt trains, which allow faster speeds on curves. Tilt trains have the potential to dramatically reduce schedule times on existing rail lines in the U.S., particularly in the Boston-New York City corridor.

There are no high speed commercial maglev systems presently operating in revenue service. The German Transrapid system has been undergoing test for almost five years on a 19.5-mile test track and has been certified by the German Government to carry passengers during demonstration rides. Many U.S. citizens, including myself, have had the opportunity of this experience. This system has been proposed for an 18-mile operation between the Orlando, Florida, International Airport and Disney's Epcot Center, with construction to begin as early as 1990. The Japanese also have high speed maglev systems under development; however, they are considered to be several years further away from revenue operations than the Germany system.

QUESTION 2B: What is the state of progress for an American-based system, either high-speed rail or maglev, today? Are any approaching operation?

ANSWER:

Except for Amtrak's Metroliner service with a maximum speed of 125 m.p.h., there are no American designed high speed rail or maglev systems in either passenger service or prototype testing at the present time. Some American designed maglev systems have been developed to the scale model stage, but these efforts are some years from being ready for revenue operations or prototype testing.

QUESTION 2C: Can you identify any known competitive disadvantages that American manufacturers labor under compared to the Japanese or Europeans?

ANSWER:

I cannot think of any competitive advantage European and Japanese manufacturers have over American companies. What the Europeans and Japanese have, and have had for years, is government support for research and development (R&D) for maglev and high speed rail technology. Europe and Japan have spent billions of dollars on maglev and high speed rail R&D.

QUESTION 3A: Have any systems been plagued by safety problems? Did not the German maglev system suffer from a fire?

ANSWER:

None of the operating high speed systems has had safety problems. Their experience is quite the contrary. For example, the Shinkansen has operated since 1964 without a single fatality. During test operations at the Emsland Test Facility in Germany, the Transrapid TR-06 vehicle did experience a fire. This fire was attributed to special test equipment on board at the time and was not caused by any component of the TR-06 vehicle itself.

QUESTION 3B: How would you compare the various maglev system proposals/systems from a safety standpoint?

ANSWER:

We began safety assessments of maglev only this summer and are unable to compare the systems from a safety standpoint at this time. The assessment will cover all maglev technologies but will concentrate initially on attractive systems because of the State of Florida's announced plans to begin design and construction on the attractive German Transrapid system as early as 1990. As the safety assessments progress, we will be able to compare our findings on the safety of the other maglev technologies and systems.

Senator EXON. Mr. Administrator, you do not need to apologize at all. I think you gave us a better understanding of the position that you, as administrator, are going to take, and I am particularly pleased that you are on top of this. I guess when I hear of the advancements we have seen in other countries in this, I assume that you, as the FRA administrator, are as disappointed as the rest of us have been, as we have expressed this morning, at how something that once again was developed in the United States goes elsewhere.

When they start cashing in the chips and the money, we find ourselves behind in this area. As I understand it, your position at the present time is to develop safety standards, which kind of falls under your responsibility; that is the main responsibility of your area or of your agency at the present time. Is that correct?

Mr. CARMICHAEL. Yes, sir. Safety is number one. But I think stimulating the technology is number two.

Senator EXON. And, when you talk about stimulating the technology, how much money do we need to spend on research and development, when it appears to me that some of our foreign friends have solved most of those problems. Have they not? How much research and development do we need?

Mr. CARMICHAEL. There are two approaches to this process right now, and no disrespect at all to the other approach, Senator Moynihan's approach, where there will be about a \$600 million or \$700 million project to build a prototype. The secret of Mag-Lev in my mind is that if we must build a long system, if we are going to have a system that can do 250 miles an hour, then you need at least 250 miles, or 150 miles, or something like that, to truly demonstrate the profit potential of it, and the people-moving potential of it. So, Senator Moynihan's approach is to take it from the—let the Federal Government build a prototype somewhere in the United States. FRA, under the Bush administration, under Secretary Skinner, our approach is that we think the research is fairly well finished, and it is a matter of assessing the market and assessing the two technologies that are out there. And find out in our marketplace what the manufacturers want to do here and what the financiers are doing. And to work toward an operating, a profit-making system as early as possible in this next decade.

Senator EXON. That is all very encouraging, but let me ask this next question. Have our traditional railroads of today shown interest in this new innovation, which, by any other name, is still a railroad, except that it does not have a road to run on anymore, but have the existing railroads looked at this? Have they expended any money to spark their interest? Where are the railroads in this matter?

Mr. CARMICHAEL. They did, as I understand, and in doing my history, they did in the past. But our railroads in the United States are freight railroads. And they are not passenger railroads. So we have developed in this country a freight railroad system with a passenger railroad operation on the freight railroad system. It is not coming from that direction. They are not looking at magnetic levitation. However, some of the interesting sides of magnetic levitation shows that it has a freight potential for high speed freight. So it is not the traditional freight railroads. It is not their ballpark.

And they have not spent time in the recent years in this technology.

Senator EXON. It would seem to me, Mr. Carmichael, that some of the environmental concerns that we have here, is that whatever we call our railroads today, and whether they are passenger railroads or freight railroads, and I agree with your definition, are we going to take up a whole lot more land building another railroad system alongside the railroad that we have now for something like this levitation principle? Has there been any consideration of rights of way of existing contact railroads to cooperate in this effort?

Mr. CARMICHAEL. Let me try to answer the question this way. I see, as we move into the use of high speed rail and the Mag-Levs, I think we are going to get both of them in this next decade. But I see it evolving—the Amtrak passenger system already has some high speed operations. So Amtrak will move into it if this government and we decide that we want to have more rail passengers, Amtrak can very easily move into more high speed rail corridors.

The Mag-Lev system's FRAs worry and concern is that if these Mag-Levs were built separate from the railroad system, it will violate the same rule we have done in the past; they will not be intermodal. I can see Amtrak with high speed rail evolving into the 21st century with Mag-Lev systems connecting to the high speed rail and the Amtrak system. As we help put together these, or play the lead role, the main thing we want to do is to make sure that they are intermodal. And we want to be sure they are part of a total transportation system for the United States in intermodal passenger system. So the right of ways, some of the right of ways, may be highway right of ways, where there are good, long, straight sections.

Others, like in Paris and France, they have high speed rail out in the country and they come in and go on to the conventional rails on into the city. So that will—if we do an intermodal system, Mr. Chairman, we are going to be combining all of the different type rails and magnetic systems that we have right now. They should be combined and they are an extension of each other.

Senator EXON. In other words, at the present time, you do not visualize the necessity for brand new right of ways. You are, at least, thinking along the lines of using highway right of ways and our railroad right of ways today.

Mr. CARMICHAEL. The only way to make this technology work sometimes is the cost of the right of ways has got to be minimal. If we have to go buy new right of ways, then the thing becomes—does not become a financial project. And so using existing right of ways, whether railroads or highways, makes good sense.

Senator EXON. Thank you very much, Mr. Carmichael. I appreciate your being here. I have to leave to go to the Armed Services Committee. I will be back as soon as I can.

Senator Robb, I would appreciate very much your taking over the chairmanship of the subcommittee now. And I would advise you that Senator Pressler, under the early bird rule, would be recognized next.

Senator ROBB [presiding]. Senator Pressler.

Senator PRESSLER. Thank you, Mr. Chairman. I want to thank Chairman Exon for holding this hearing and looking into these very important questions. It is something I am extremely interested in. I greet the witnesses, and I will read their testimonies carefully.

This is one of those days when I have three committees going at once—I think we need to reorganize ourselves here in the United States Senate—so I have to move around this morning, but I will read each testimony, because I am very interested in this.

Let me ask the panelists here—you have mentioned that the FRA will be a positive stimulus in developing these projects. I suppose that in anything we have competition as to which direction to go with limited funds. That is the challenge of your job, that is why you are paid so highly. But, in any event, does this include funding for track rehabilitation for higher speed trains?

Mr. CARMICHAEL. I would like to—our approach, FRA's approach, is to do the preliminary work to help the private sector do the roadway, do the guideway and build the vehicles themselves. We think there is a real opportunity out there in the private sector right now to build these systems, and the whole railway system has been built on private right of ways. So if FRA's approach is to instead of doing a big, huge prototype, we think the market is ready out there for us to put together a prospectus, a market analysis, and go out and seek the manufacturers and the bankers to put the system together. And we think we have seen enough signs of the manufacturers being interested in building it in this country. And I think there is some venture capital out there.

Every time I have gone to a high speed rail meeting, I have met with foreign bankers that keep saying we want to finance this project, if you get into it, or if you adopt the project. And so I think the money is there to do the infrastructure and to do the vehicles. It is just a matter now of selecting the technology and helping the states, many of these states will put up part of the money, if it needs so much private money, and it needs so much grant money. And the states are willing to do it.

So the repair or the creation of that right of way, if we use existing right of ways, is very attractive to the bankers, Senator.

Senator PRESSLER. Thank you.

Senator ROBB. Thank you, Senator Pressler. And thank you, Mr. Carmichael. I understand that Chairman Exon had asked the questions that he had proposed to ask for the subcommittee. And so we thank you very much for your testimony, and we will excuse you at this time.

Mr. CARMICHAEL. Mr. Chairman, thank you very much.

Senator ROBB. We will now ask the next panel to come forward, if you will, please.

Our next panel consists of Mr. Paul Reistrup, who is chairman of the High Speed Rail Association and president of the Monongahela Railway Company; Mr. Richard Katz, chairman of the California-Nevada Super Speed Train Commission; and Dr. Richard A. Uher, director of the High Speed Ground Transportation Center at Carnegie Mellon University. I do not know if any of the three of you have determined an order. Unless, Mr. Katz, are you prepared to lead off? Was that your signal?

Mr. KATZ. Mr. Chairman, whatever the pleasure of the chair is.

Senator ROBB. If there is no particular preference, we could go ahead in the order you listed on the agenda. I am a substitute, as you can tell, for the subcommittee chair; I was called out of another meeting to ask if I would come over and pinch hit; although I am on the subcommittee, I did not converse ahead of time with Mr. Exon.

Mr. Reistrup, since you are listed first, why do we not go ahead with your testimony first, if you will.

STATEMENT OF PAUL H. REISTRUP, CHAIRMAN, HIGH SPEED RAIL ASSOCIATION; PRESIDENT, THE MONONGAHELA RAILWAY CO.

Mr. REISTRUP. Senator Robb, it is good to be here. And probably because the High Speed Rail Association now has 400 members from all walks of life and interest including the governmental people involved in high speed rail, consultants, equipment manufacturers, labor unions, this might give an overview.

We have had quite a history of high speed rail in the world, and my testimony touches on it, so I will not dwell on it here. I would like to point out that today the highest speed revenue service is in France—the TGV, the new Atlantic system at 187 miles per hour, that is miles per hour. The newest Japanese, which succeeded the 25-year-old bullet train, is now at 150 miles per hour. Both of these systems are 100 percent safe. Roughly 3 billion passengers have been carried and there has been no fatality to this date, over a 25-year period.

The United States stands number five; the other countries are England, Germany and they are far behind, though the Japanese and the French who are at this threshold of 190 miles, 200 miles an hour. The U.S. projects, which you will hear more about today, are nearing implementation. Right now in Florida today, they are concluding franchise evaluation hearings, which could lead to the award of a franchise; there are two firms bidding there.

You will hear in a moment from Mr. Katz on the Nevada-California effort, which is also at the implementation stage, a mix of State, local, in the case of the city of Las Vegas, and private capital plus, of course, public support. In Ohio, they are getting close to awarding, or they have invited bids on a turn key type approach, which would be a mix of private and government interest, so that they can build there. Texas has just passed enabling legislation. The Governor just signed it in the last few months. So those four projects are right up at the top, Florida probably leading somewhat.

My feeling about this is that the Federal Government, as Mr. Carmichael said, should support this effort. Having been president of Amtrak many years ago in the 1970's, I know how hard it is to get money to run that, and certainly to build these multibillion dollar projects. So it seems to me that the role of the Federal Government is to support this local, state, private effort. And to facilitate that development. Let us call it the application of this technology, rather than the basic research and so forth at this point.

I think we have to avoid the loss of momentum. For instance, there is legislation now which allows tax-free bonds to be issued to support high speed rail projects. The loss of that would be very, very harmful. The financial community needs to see that there is support in the Federal Government, even though there might not be large government funds involved.

In conclusion, this high speed rail has a fit—medium distance, 250, 300, maybe 400 miles, it can replace traffic jams, crowded airways. We are not talking about going clear across the country's 3,000 miles, but in those corridors where there is population and congestion and it appears that they can pay for the operation out of the fare box. There will need to be support—real estate tax-free bonds, so forth, for the capital funding. But it appears that—the Metroliner experience bears this out—the trains will pay for their own operation.

Thank you very much.

[The statement follows:]

The lesson to be learned is that shorter journey times and frequent schedules with reliable, safe comfort established a rail passenger role firmly that carries on 50 years later. These fast trains ran only in selected heavy traffic corridors, relative short distance at high speeds (Chicago - Twin Cities is 660 km by rail).

Major improvements to the U.S. highway system beginning in the early 1950's removed rail from its leadership role. Even major new investment in equipment did not arrest the decline, but there was no marked improvement in travel time! The coming of the jet airplane took the first-class Pullman market from rail.

Decline in coach (second-class) rail travel was found to be inversely proportional to increase in automobile trips along new Interstate Highways. Railroad management, entirely in the private sector, began to withdraw passenger services until Amtrak was created. U.S. railroads had to concentrate on fighting for their lives, in the freight business, against highway trucks and waterway barges. These modes used government financed improved rights-of-way. Government investment in commuter rail did not begin until the 1960's. In Chicago, a very heavy rail commuter area, government funded equipment on my employer, at that time The Illinois Central, did not arrive until the 1970's.

One must also recall that in the United States there were many parallel competing railroads, in many cases, with passenger service. Chicago to St. Louis, for example, has three strong passenger rail competitors. To remain in the freight market, railroads were forced to increase axle loadings, introduce 100 ton cars, increase freight train speed. This adversely affected passenger ride quality when coupled with lower maintenance expenditures. Also, curve super elevation or "CANT" was lowered because of higher freight car center of gravity. This reduces passenger train speeds and lengthens schedules.

Then came the Japanese "Bullet Train" in the introduction of the Tokaido Line in 1964. Now called Shinkansen, these 210 km/hour multiple schedule, 100 per cent safe services led the Metroliner. With a mix of private (Pennsylvania Railroad) and government funding, hourly schedules of approximately three hours at maximum speeds of 177 km/hour were introduced. For a short period speeds of 201 km/hour were authorized until ride quality deteriorated because of lack of track maintenance.

The Metroliner proved that fast rail passenger services provided over shorter distances (363 km in this case) could take substantial market share away from airlines. The bankruptcy of Penn Central brought further decline in ride quality until the beginning of government support. Amtrak was formed to relieve railroads (especially Penn Central) from fiscal passenger responsibilities. Ridership loyalty remained high even against these adverse factors.

The U.S. government decided to improve the Washington, D.C. to New York City line and extend upgrading Northeast to Boston. This effort was called "The Northeast Corridor Improvement Project" (NECIP) which would cost some two billion U.S. dollars.

At the same time Amtrak acquired the right of way from Conrail, the successor to Penn Central, in April 1976. Certain portions of the line had previously been deeded or leased to commuter rail regional authorities adding to the complications. Amtrak and NECIP did gain through service rights between end points.

To understand the complexity of the institutional coordination challenge, one must remember that three freight carriers operate on NECIP - Conrail, Delaware & Hudson and Providence & Wooster. There are five commuter authorities - Maryland, Southeast Pennsylvania, New Jersey Transit, Metropolitan Transportation Authority of New York, Connecticut and Massachusetts Bay. These commuter operations service all the large cities on the corridor.

In fairness, NECIP was largely a rehabilitation project with substantial upgrading. All work was performed under traffic of up to 1,000 total train movements per day. Dedicated passenger tracks received concrete cross ties. Bridge work and relocation of turnouts and crossovers in interlockings allow faster operations. Stations were thoroughly renewed.

All highway crossings were removed south of New York. A mix of new and renewed signal, electrification and communication facilities were installed. The result has been reflected in ridership increases.

Northeast Corridor passengers increased from 10.7 million in 1987 to 11.2 million in 1988. The fastest train covers the Washington - New York City segment in two (2) hours forty (40) minutes. Amtrak has 45 percent of the end point market share against air shuttle by Trump and competing Pan Am.

So the ground work has been laid for public acceptance of higher speed rail in the United States. Highway gridlock and airway congestion in major population areas sets the stage for the future. My assessment is that there is strong demand for change in the people transportation mix.

FUTURE:

The great success of the French TGV operating at speeds of 275 km/hour and improved Shinkansen to 241 km/hour has rekindled interest in the passenger rail intercity alternative. Operating speeds are substantially already above the existing 177 km/hour in The Northeast Corridor. There are several high speed rail projects in the United States that are nearing the implementation stage. Plans envision speeds of 240 to over 300 km per hour. The upper ranges are seen in the TGV Atlantic and German ICE.

Both steel wheel on rail and magnetic levitation are on the drawing boards. Each project in the U.S. is regional in nature, and involves private financing. The Federal government has provided funds to support the planning process. Most investment has been at the state and local level. A summary follows.

FLORIDA

Following planning work by a governor appointed committee, state legislation was passed to provide implementation of H.S.R. The corridor designated is Miami to Orlando (Disney World area) and on to Tampa.

The commission established by statute has completed the review process of some 13 conceptual proposals. Two actual franchise applications are now in the final stages of analysis. Public hearings were recently concluded.

The High Speed Rail Transportation Commission is to award the franchise by 1991 if all criteria are met. Private investment of many millions of dollars has already been expended. It is contemplated that real estate development will provide capital funding support. Tax free bonds enabled by federal legislation provide a borrowing method. Costs of this inter-city project are estimated to range from two to five billion dollars.

In addition a new proposed operation between Orlando airport and Disney World is to be considered for franchise. One qualified applicant is undergoing review by the Commission, a project utilizing the German Trans-Rapid technology financed by Japanese. Because of the short distance, a top speed of 200 km/hour may be the maximum. However, this could be an excellent revenue service test of magnetic levitation which has only test trade experience to date.

The Florida concept includes a possible second stage magnetic levitation which would succeed the steel wheel on steel rail system. Also, there are possible extensions within the state to other population centers.

NEVADA - CALIFORNIA

Termed "Super Speed", this two state project was initiated by the city of Las Vegas. Phase II studies completed in 1986 included ridership verification, socio-economic impacts, environmental review, financial planning and technology assessment. The latter is being up-dated this year.

The Bi-State Commission now in place took over the work previously led by the city of Las Vegas. Although only magnetic levitation had been originally envisioned, very high speed rail at the 300/km mark could qualify.

Construction start circa 1991 is anticipated at costs in the two billion dollar range. Las Vegas is a major entertainment attraction to California's large population and the latter state sees construction activity as a socio-economic factor and looks to extension of H.S.R. to major cities.

TEXAS

Led by a German consortium, private studies of high speed rail in the heavily traveled Texas Triangle were begun several years ago. Initially the large cities of Dallas - Houston would be connected. Later San Antonio and Fort Worth would complete the triangle.

State interests determined that studies should be conducted before awarding a franchise to construct. The Texas Turnpike Authority was selected to lead this analysis. This may bode well for the future of H.S.R. because in the U.S., highway people get things built. The governor of Texas recently signed legislation to form a high speed rail corporation.

The German ICE train is proposed for the corridor, known as the most heavily traveled highway concentration in the country, there is a national market. It should be noted that Texas Air started in the same location. Expansion led to the formation of New York Air, takeover of Continental and other airlines.

OHIO

Some years ago a major effort to initiate high speed rail fell short of approval. Politics and a proposed state tax led to the deferral.

Now the Ohio High Speed Rail Authority is entertaining turnkey proposals. This would include finance, design, construct and operation.

Initially the cities of Cleveland, Columbus, Cincinnati and Dayton would be served. The authority plans to accept or reject the favored proposal by the end of 1989. Details, of course, must await selection of a proposal.

In addition to the four separate high speed rail projects above, others are in various study stages. The report on a Philadelphia to Pittsburgh route has now been publicly released. Support from both political and industrial leaders must be forthcoming to move this Pennsylvania project.

There is a coordinated effort of the governors of the states of Massachusetts, Rhode Island and Connecticut to speed up the North end of Amtraks Northeast Corridor. Because of many curves tilt train technology may be indicated. Perhaps electrification extension from New Haven to Boston will again be sought. This latter element was removed by the past federal administration in an economy wave. The target is a one hour reduction in running time.

Other past studies review potential in the Chicago area, to St. Louis, Detroit and Milwaukee in a "hub and spoke" configuration. Upstate New York, serving Albany and Buffalo was improved to 177 km/hour. A new contiguous route on to Montreal was analyzed, and a Quebec to Winsor high speed rail system is now being proposed.

Pursuit of these other services must await the success of the leading contenders-- Florida, Nevada-California, Texas and Ohio. There could be a race to build by those who now have a "watch, wait and see" attitude. A corollary concept of tying state projects together is also a possibility.

An interstate compact exists, including Pennsylvania, Ohio, Michigan, Indiana and Illinois. The Ohio and Pennsylvania segments could be linked by building between Pittsburgh and Cleveland for example.

I am very enthused about the implementation of high speed rail in the United States. Technical expertise is a given. WE have seen the "Chunnel" project financed privately which proves that it can be done.

Please feel free to ask questions on anything I have addressed. It is a pleasure to be in this country. Our railroad delivers coal to Tai Power and close family friends and neighbors are from Taiwan.

Senator ROBB. Thank you, Mr. Reistrup.
At this time, Mr. Katz.

STATEMENT OF RICHARD KATZ, CHAIRMAN, CALIFORNIA-NEVADA SUPER SPEED TRAIN COMMISSION

Mr. KATZ. Senator Robb, thank you very much.

I am also chairman of the California Assembly Transportation Committee. I am here today as chairman of the California-Nevada Super Speed Train Commission. I would like to thank your committee, and in particular, Senator Reid, who was here earlier for his leadership, and Senator Bryan, for their support of these efforts.

I would like to give you a little bit of an overview of just what we are doing and some observations. The California-Nevada Super Speed Train Commission was created by the two states to oversee the privately financed introduction of modern intercity ground transportation. We envision eventually a network of trains operating up to 300 miles per hour between the major centers of the Pacific Southwest United States.

By December of this year, the commission will decide whether to take the initial step in the creation of this network. If we decide to proceed we will ask the private sector to identify a commercially viable project linking the Las Vegas Valley with one or more southern California candidate station areas under a franchise awarded by the two states. The franchise proposals would be required to address providing commuter services within southern California, as well as linking as many of the candidate areas as possible.

The benefits to our environment and the relief of congestion are extensive. The commission has just completed studies which highlight the benefits to be received from such a project. The Super Speed Train [SST] has the potential to serve over 6 million interstate travelers a year between southern Nevada and southern California. Included among these travelers are up to 1 million that would otherwise be driving their own cars and adding to traffic congestion, contributing thousands of tons of pollutants from tail pipe emissions and burning millions of gallons of fuel each year, were the train not to be realized. The commission and the California legislature are particularly interested in the commuter potential for super speed train service that could link growing bedroom communities in the inland empire of San Bernardino and Riverside counties with the expanding job centers in Los Angeles and Orange County.

There is currently no commuter rail service in this 40-mile corridor, and some of the freeways are carrying over 250,000 vehicles a day, most of them in bumper-to-bumper traffic. Round-trip commuters to this corridor commonly take up to four hours daily. Preliminary numbers indicate that the SST could carry a minimum of a half million commuters a year. Two lines serving Orange county and linking with trains going through the San Fernando Valley and Palmdale could carry another 2.3 million passengers, many heading for the proposed Palmdale commercial airport.

The ridership statistics not only support the financial feasibility of the private construction operation of the SST, but they also

promise major environmental gains. As everyone is well aware, we are struggling in southern California to meet healthful air quality standards. The SST actually offers some hope. Over 1 million interstate travelers in between 1½ and 2½ million commuters could leave their cars to ride this new, fast, quiet, non-polluting system.

Approximately 70 million vehicle miles traveled would be trimmed from the region's trips each year, resulting in reduced tail pipe pollutants by hundreds of tons, and saving millions of gallons of fuel. In fact, estimates just in the Las Vegas to southern California corridor alone, are a fuel reduction of 16 to 17 percent.

These are net gains for the environment. And it is important that we note this, because often we hear talk about the need for offsets or tradeoffs for industry if we are going to move ahead on something like this. We ought to view this as a net benefit to the environment and not give that up.

In addition to the environmental benefits, the SST will provide the United States with a chance to demonstrate the cutting edge of new transportation technology at little or no cost to the taxpayer. Reliance on private financing for the project is possible through value capture development opportunities at station locations, as well as ridership that will generate revenues from the fare box.

The commission is going to select a conditional franchisee by late 1990. After satisfying local, State and Federal requirements, and obtaining approval by the legislatures and governors of both states, we hope to begin construction as early as 1993, with the system online by 1998. In order to meet our schedule, California and Nevada are pursuing first generation super speed ground transportation technology, such as TGV and Mag-Lev. First generation projects in the United States represent a golden opportunity for real progress, in dealing with some of the worst transportation problems, while beginning to address America's competitive position.

I would like to offer in conclusion the following recommendations, and urge Congress to move immediately on these fronts. Some of these questions were raised earlier by the Senators. One, we would like to request that we provide incentives for, or otherwise facilitate, U.S. industrial involvement in the fabrication as well as construction of first generation projects. Second, and this addresses the earlier R&D question, we believe R&D is necessary and sufficient, not for first generation entry, but for America to be on the ground floor of the second generation market. Third, to provide inducements for U.S. industry to get involved in mass transportation, which has been neglected for far too long. Fourth, to provide incentives for U.S. airlines to test economic feasibility of switching to super speed trains for feeder services under 350 miles into major hub cities. Fifth, to create a climate for economic operation of passenger trains based on super speed trains by the private sector. This may involve a new look at statutes and regulations applying to conventional American railroading. And finally, to remove any obstacles to super speed use of federally assisted rights of ways, especially on the highways.

Senator Robb, I appreciate your support and your interest for the projects and what we are trying to do in our commission and the legislature of both States. I look forward to working with this sub-

committee and the full committee in any way we may to improve the technology and get America into the forefront of this new technological age.

Thank you very much.

[The statement follows:]

STATEMENT OF ASSEMBLYMAN RICHARD KATZ

The California-Nevada Super Speed Train Commission was created by the two States to oversee the privately-financed introduction of modern intercity ground transportation. We envision an eventual network of trains operating up to 300 mph among the major centers of the Pacific Southwest region.

By December 1989, the commission will decide whether to take the initial step in creation of this network. If we decide to proceed, we will ask the private sector to identify a commercially-viable project linking the Las Vegas valley with one or more southern California candidate station areas under a franchise awarded by the two States.

These "franchise proposers" would be required to address providing commuter services within southern California as well as linking as many of the candidate areas as possible. The benefits to our environment and the relief of congestion are extensive.

The commission has just completed studies that highlight the benefits for this step into the next technological age. The super speed train, or SST as it's called, has the potential to serve over 6 million inter-state travelers a year between the Las Vegas Valley area in southern Nevada and the southern California area.

I offer the following recommendations and urge Congress to move immediately on these fronts to advance development of super-speed ground transportation in the United States:

1. Provide incentives for, or otherwise facilitate, U.S. industrial involvement in the fabrication, as well as construction of, first-generation projects.
2. Commence research and development necessary and sufficient for America's ground-floor entry into the second-generation market.
3. Provide inducements for U.S. industry to get involved in mass transportation which has been neglected for far too long.
4. Provide incentives for U.S. airlines to test the economic feasibility of switching to super-speed trains for feeder services under 350 miles into major hub cities.
5. Create a climate for economical operation of passenger trains—based on super-speed trains—by the private sector; this may involve a new look at statutes and regulations applying to conventional American railroading.
6. Remove any obstacles to super-speed use of federally-assisted rights-of-way (especially highways).

Thank you for your attention . . .

Included among these travelers are up to a million that would otherwise be driving in their own cars and adding to traffic congestion, contributing 1,000's of tons of pollutants from tail pipe emissions, and burning millions of gallons of fuel each year.

The commission and California Legislature are particularly interested in the commuter potential for super speed train service that could link the growing bedroom communities in the inland empire of San Bernardino and Riverside Counties with the expanding job centers in Los Angeles and Orange County. There is currently no commuter rail service in this 40-mile corridor, and some of the freeways are carrying over 250,000 vehicles a day, most of them in bumper-to-bumper traffic. Round-trip commutes through this corridor commonly take more than 4 hours each day.

Preliminary numbers indicate that the SST should carry a minimum of one-half million commuters a year with only two southern California stations. Two lines serving Orange County and linking the San Fernando Valley with Palmdale could carry another 2.3 million passengers, many headed for the proposed Palmdale Commercial Airport that has stalled in recent years due to access problems.

The ridership statistics not only support the financial feasibility of private construction and operation of the SST, but they also promise some major environmental gains.

As we're struggling in southern California to meet healthful air quality standards, the SST offers major air quality gains. Over a million interstate travelers and between ½ and 2½ million commuters may leave their cars to ride this new fast, quiet and non-polluting system. Ten's of millions (approx. 70 million) of VMT's or vehicle-miles-travelled would be trimmed from the region's trips each year, reducing

tail pipe pollutants by hundred's of tons, and saving millions of gallons of fuel . . . estimates put fuel savings in the Las Vegas to southern California corridor alone at 16 to 17 percent.

These are "net" gains for the environment, and require no off-sets or trade-offs to protect industry against economic losses.

In addition to these environmental benefits, the SST will provide the United States with the chance to demonstrate the "cutting edge" of new transportation technology at little or no cost to the taxpayer. Reliance on private financing for the project is possible through "value-capture" development opportunities at station locations as well as ridership that will generate revenues from the fare-box.

And U.S. companies will directly participate in the development of a new-age high-tech transportation system, and that means new jobs and experience for entering and competing in the high-tech transportation markets of the future.

Finally, I mentioned the concept earlier of a network of super speed, high speed and commuter rail systems that would link the economic centers of Arizona, Nevada and California. The commission is committed to expanding benefits of SST throughout the Pacific southwest.

The commission will select a conditional franchisee by late 1990. After satisfying all local, State and Federal requirements and obtaining approval by the legislatures and governors of both States the franchisee will construct and operate the train without public subsidy. Construction may begin as early as 1993, with the system operating by 1998.

In order to meet our schedule, California and Nevada are pursuing what is known as first-generation super-speed ground transportation technologies such as the French TGV and German Transrapid Maglev Systems. First-generation projects in the United States present a golden opportunity for real progress in dealing with some of our worst transportation problems while beginning to address America's competitive position.

Senator ROBB. Thank you very much, Mr. Katz.

Before we have any questions, we will hear from our third panelist, Mr. Uher, who is the director of the High Speed Ground Transportation Center at Carnegie Mellon University. Mr. Uher.

STATEMENT OF RICHARD A. UHER, DIRECTOR, HIGH SPEED TRANSPORTATION CENTER, CARNEGIE MELLON UNIVERSITY

Mr. UHER. Senator Robb, and ladies and gentlemen, I appreciate this opportunity to testify before the subcommittee, because a passenger transportation crisis exists in the United States today. Transportation experts predict that this crisis will severely worsen as the 21st century approaches. Gridlock is expected to become more and more common on our highways and in our airplanes.

The estimated cost of delay to the passenger will increase from \$8 billion annually in 1985 to nearly \$60 billion in the year 2005 in the highway and air modes of transportation, in terms of present dollars. During the past 25 years, new high speed ground transportation technologies have been developed which offer potential top speeds up to 300 miles per hour. It is said that for trips ranging from 100 to 600 miles, the high speed ground transportation mode may be more efficient than highway or air. In this range the private auto is too slow, and will become slower as the result of increasing congestion.

And the air mode gives a false sense of speed, since door to door travel time is relatively long for these distances. High speed ground transportation systems which can link airports and metropolitan centers with access to the urban and regional sprawl which is created by the private automobile, may play a major role in helping to ease the worsening effects of the passenger transportation crisis.

These systems can complement the air and highway modes, especially if properly interfaced with them. Such regional systems can utilize the airport of a major transportation area as a hub, and extend service to smaller cities or airports in the surrounding region. The hubbing concept can, in many cases, be handled more effectively by high speed ground transportation, freeing valuable air space for longer distance flights. And as our economies become more strongly linked with those of Europe and Asia, the necessity for long distance flight will become greater.

Since such regional high speed ground transportation lines will access the major airport through the suburban areas surrounding the major metropolitan airport, it is highly likely that these same lines can be used for suburban commuting and airport access on the ground side as well. Since the lines for the high speed regional service would already be in place, the suburban commuter and airport access system could be obtained at a marginal capital cost increase over the regional system cost.

To generate early revenue, the suburban commuter system would be built prior to construction of the regional system. The regional system is simply an extension then of the suburban system, which provides better access to the air mode as well as the high speed ground transportation regional service. And this is similar to what has been talked about in California: the interfacing of the airports to the highway mode through high speed ground transportation.

As in all new transportation developments of the past, new institutions of private public partnerships will be required. The nature of these institutions is still an unknown quantity, and further study is required into their creation and operation.

In summary then, the United States is becoming more and more dependant for its mobility on its highways and airways which are overloaded. High speed ground transportation systems linking the major metropolitan airports to the urban and regional sprawl can complement the highway and air modes and rise above the present congestion. These systems will help soften the national transportation crisis which we all face.

Senator Robb, thank you very much for the opportunity to testify. And I would be pleased to answer any questions you or your colleagues might have.

[The statement follows:]

STATEMENT OF RICHARD A. UHER, HIGH SPEED GROUND TRANSPORTATION CENTER, CARNEGIE MELLON UNIVERSITY, PITTSBURGH, PENNSYLVANIA

EXECUTIVE SUMMARY

The United States faces a transportation crisis. Congestion on our airways and highways is rapidly increasing. From 1985 to 2005, highway vehicle delay is predicted to increase from 3 billion to 12 billion vehicle-hours. The estimated cost of delay to airline passengers during this same period is expected to rise from \$8 billion annually to \$60 billion in constant dollars.

High speed ground transportation ("HSGT") offers an attractive alternative. HSGT represents an entirely new mode of transportation, and is potentially superior to both airplanes and automobiles for trips of between 100 and 600 miles. HSGT systems linking airports and metropolitan centers with access to the urban and regional sprawl can help alleviate this nation's worsening transportation crisis.

Regional HSGT systems with top speeds of up to 300 miles per hour can potentially utilize the airport of a major metropolitan area as a hub, and extend service to smaller surrounding cities or airports. Use of HSGT for regional transit between hubs will free scarce airspace for longer distance and overseas flights. In addition, the lines used for regional high speed service could also be developed for suburban commuting and airport access.

New institutions and new public/private partnerships will be required to implement HSGT systems here. Economic development or

redevelopment would take place at system nodes (stops), and staged construction and operation of shorter suburban lines could provide early revenue needed to build regional networks.

New developments in HSGT technology, particularly MAGLEV, now offer potential speeds in revenue service of 200 to 300 miles per hour. HSGT technologies, if linked attractively with this nation's air and highway modes, can ameliorate our present congestion.

In order to provide the Subcommittee with more detailed information, the following technical papers are incorporated into this testimony:

Exhibit 1 -- The Role of High Speed Maglev in the Future
U.S. Transportation System

Exhibit 2 -- Research and Development Needs For High Speed
Ground Transportation in the United States

The above exhibits 1 and 2 were not reproducible.

Mr. Chairman and Members of the Subcommittee:

I appreciate this opportunity to testify before the Subcommittee, because a passenger transportation crisis exists in the United States today. Transportation experts predict that this crisis will severely worsen as the twenty-first century approaches. Gridlock is expected to become more common on our highways and airplanes. Present data trends in these two major passenger travel modes suggest that congestion is rapidly increasing. Between the years 1985 and 2005, highway vehicle delay is predicted to increase from 3 billion to 12 billion vehicle-hours. During the same time period, the number of airports with chronic delay (average delay per takeoff or landing greater than eight minutes) will increase from 11 to 47. The estimated cost of delay to the passenger will increase from \$8 billion annually in 1985 to nearly \$60 billion dollars in 2005 in terms of present dollars.

During the past twenty-five years, new high speed ground transportation ("HSGT") technologies have been developed which offer potential top speeds up to 300 miles per hour. Thus, from a market perspective, HSGT can be viewed as a new mode of transportation, in between the air mode and that of conventional rail. It is said that for trips ranging from 100 to 600 miles, the HSGT mode may be more efficient than highway or air. In this range the private auto is too slow and will become slower as a result of increased congestion. The air mode gives a false

sense of speed, since door to door travel time is relatively long for these distances. Because of increasing highway congestion around airports in the urban areas and increasing numbers of flight delays, door to door travel times in the future are expected to grow longer.

HSGT systems which can link airports and metropolitan centers with access to the urban and regional sprawl may play a major role in helping to ease the worsening effects of the passenger transportation crisis in the twenty-first century. These systems can complement the air and highway modes, especially if proper interfaces are constructed.

Regional HSGT systems with top speeds of up to 300 miles per hour make a great deal of sense. Such regional systems can utilize the airport of a major metropolitan area as a hub, and extend service to smaller cities or airports in the surrounding region. The hubbing concept, now practiced at many of these major airports, can in many cases be handled more efficiently by HSGT, freeing valuable airspace and airports for longer distance flights. As our economy becomes more strongly linked to those of other nations, demand for long distance and overseas flights will continue to increase rapidly.

Since such regional HSGT lines will access the major airport through the suburban areas surrounding the major metropolitan airport, it is highly likely that these same lines can be used for

suburban commuting and airport access on the ground side as well. Since the lines for the high speed regional service would already be in place, the suburban commuter and airport access system could be obtained at a marginal capital cost increase over the regional system cost. To generate early revenue, the suburban commuter system could be built prior to construction of the regional system. The regional system is simply an extension of the suburban system, which provides better access to the air mode as well as the HSGT regional service. This concept of building from small to large in transportation is not new. Historically, this method has been employed in every mode of transportation, including railroads, trolleys, highways and air.

The nodes (stops) of these systems would be prime candidates for more orderly economic development or redevelopment. Because the auto, taxi or feeder bus would be the primary modes of transportation to the HSGT nodes, the interfaces must be well designed to accommodate the user.

As in all new transportation developments of the past, new institutions and private/public partnerships will be required. The nature of these institutions are still an unknown quantity, and further study is required into their creation and operation.

During the decades of the 1960s and the 1970s, HSGT referred to systems, including rail, which had top speeds of approximately 125 miles per hour. During the 1970s, developments in Japan and

France raised the top speed of high speed rail ("HSR") technology above 150 miles per hour, and during the 1980s the TGV of France has been operating successfully in revenue service with top speeds of 168 miles per hour.

Although speed records of approximately 250 miles per hour have recently been achieved by HSR systems (notably the TGV and the German prototype Intercity Express), most experts would agree that these technologies will operate in revenue service at speeds below 200 miles per hour. For MAGLEV systems, present top speeds can be expected to lie in the 200-300 miles per hour range. It is expected that these systems will become commercially available during the 1990s.

In summary then, the United States is becoming more and more dependent for its mobility on its highways and airways. These systems are now overloaded and will become increasingly crowded. HSGT systems linking the major metropolitan airports to the urban and regional sprawl can complement the highway and commuter air modes and rise above the present congestion. These systems will help soften the national transportation crisis which we all face.

Mr. Chairman, thank you very much for the opportunity to testify. I would be pleased to answer any questions you or your colleagues may have.

Senator ROBB. Thank you, Mr. Uher. Let me ask a general question, if I might. I do not know if it was touched on by the earlier panel, but with the early pioneering efforts by the United States in this particular field, most of the subsequent development has taken place in Japan and Germany and elsewhere. Can you give us some indication of just how far behind the United States is in the technology at this point, and what we might have to do to catch up in terms of some of our own domestic industries in this area? Does anybody want to take a shot at that? Dr. Uher?

Mr. UHER. I will try that one. In terms of Mag-Lev technologies, and it probably would be the same with high speed rail technologies, we are around seven to 10 years behind in starting from scratch to develop these new technologies. For example, the TGV, took 25 years to develop in France. And the Mag-Lev technology certainly took over 15 years to develop in Japan and Germany. So in developing things from scratch, we have a problem, but in joining with German and Japanese technology and perhaps manufacturing here, we still could Americanize the technology and provide the solution to our transportation problem.

Mr. KATZ. Senator, I also think that part of the answer is that when you look at the generational development of the technology that will take place—what is on the ground now is obviously being done, as you said, by the Germans and the Japanese and others. The question is going to be, can we leapfrog to the next generation and can we catch up that way by really looking ahead. And not trying necessarily to get to where they are today, but figure out where they are going to be, or get past them down the road. I think that is where we ought to be focusing our R&D money.

Senator ROBB. Mr. Reistrup, did you want to comment on that question? You are not required to.

Mr. REISTRUP. I think it has been satisfactorily answered.

Senator ROBB. Let me ask a question. Mr. Katz, I think in your testimony, one of the points that you mentioned had to do with congressional inducements. I think it was your third point, if I recall correctly. The whole question of inducements and/or federal subsidies of some sort—I am curious as to whether or not you think that they are going to be needed in the R&D phase? Or are they going to be needed to, at some point, to make up the difference in the fare box? I know that one of you testified that the fare box has been adequate in certain systems to support the system. But in terms of our present state of understanding of the technology, and the economics that are part of that whole equation, are we going to be required to provide specific financial inducements? And if so, are they going to be on development? Or are they going to be in operation or both?

Mr. KATZ. From my viewpoint, I would like to see it in research and development. I think the train we are looking at between Las Vegas—the Las Vegas area and southern California—is approximately a \$3.5 billion program. We would anticipate \$2 million of public money in that program.

Senator ROBB. \$2 million?

Mr. KATZ. \$2 million—and that being the front money that has been used for studies, that is being used for evaluations. We expect to finance it, if we are going to make this train work, through de-

veloper agreements along the right of way, through other countries interested in investing in technology demonstrations here and through fare box return. We think we can finance it that way. We are not looking for large amounts of public money to make this train work.

Mr. REISTRUP. I would like to say though, Senator Robb, that when the research to get to stage two is sought, that would have to have federal money. I do not personally see anyone stepping forward to spend that kind of R&D money in this country. In fact, in Germany, I believe it was all Federal money that went into the transrapid development.

Senator ROBB. It is always risky to try to put a figure on anything, particularly if it is well out into the future. But could you give us some, just ballpark estimate of what kind of commitment at the federal level you are talking about for the phase two?

Mr. REISTRUP. I would say it would be above \$100 million, but Mr. Uher has done research on that.

Mr. UHER. Plus, I imagine some figures that were developed by Senator Moynihan came up with something like \$700 million to \$1 billion, somewhere in that area.

Senator ROBB. Mr. Uher, you mentioned the comparisons between the time for travel between two points within the one to 600 mile area that we are discussing here, and indicated that in terms of time, that this might be preferable to either door-to-door, on the air, or the increasingly congested ground transportation. How about compatibility of fares in this same equation? Do you anticipate that this type of transportation will be competitive on a fare basis? Or will it be more competitive because it is faster and more convenient?

Mr. UHER. Let me answer both parts of the question, first the time basis, by giving you an example. It takes the average Pittsburgher about four to four-and-a-half hours to get to Washington, whether he travels by car or by the air mode. If high speed ground transportation systems were in around Pittsburgh, and around the Baltimore-Washington area, that trip time would only take two hours, door-to-door, independent of whether the person took the high speed mode all the way, or the air mode part of the way. So by complementing the air mode that way, the door-to-door travel time is actually reduced in half, in that particular situation.

In terms of the fare, we feel that the fares will be competitive with air fares. They will be roughly about the same as air fares.

Mr. KATZ. Senator, in the Nevada-Southern California train we are looking at, based upon today's projections, \$104 round trip fare, which is roughly two-thirds that of air fare at this point.

Senator ROBB. Mr. Katz, I think you were referring to the system in the west. And the fact that for 25 years it has been accident-free, or there have been no fatalities, what have you, associated with it—forgive me if I am attributing the testimony to the wrong individual. Mr. Reistrup, was that your testimony?

Mr. REISTRUP. Yes.

Senator ROBB. A question on the system specifically, Mr. Katz. that you were referring to—is that the kind of technology that is designed for that terrain? For instance, the possibility of flash

floods, and more importantly, earthquakes? Does that make that less adaptable to that particular type of terrain?

Mr. KATZ. We believe that the terrain between southern Nevada and southern California would be acceptable for either TGV type technology or Mag-Lev technology. We are looking at using—to also respond to an earlier question—we are looking at using the I-15 corridor, which is in existence today, as the main route to come into California. We believe there would be no problem from an environmental standpoint.

Mr. REISTRUP. It has been my pleasure to visit the Japanese system. And during a typhoon, that was not a pleasure, but the trains operated. And they even scheduled delayed runs. For safety purposes, they did slow some of them down, when the water got high. They also have an elaborate earthquake protection and fire protection in the stations as well, doors that drop and so forth.

The whole system is designed with safety being paramount.

Senator ROBB. Are there any special challenges that we would face, where we are considering the application of this current technology that does not now exist?

Mr. REISTRUP. Not that I can think of, sir. As a railroader of 32 years, because Japan has similar problems that we do. We have, in different parts of our country, we have the faults on the west coast, hurricanes on the east coast. But it would be equivalent to what they have.

Senator ROBB. A question with respect to—we mentioned earlier, in the development of the current technology and the financing and what have you of the Japanese and the Germans are playing leading roles, what would it require to entice more U.S. participation on, strictly on the financial side? Any thoughts on that? Mr. Uher?

Mr. UHER. I would think that believability of the project. If the Federal Government did come in with some kind of dollars, then you would get manufacturing firms more and more interested in this.

Senator ROBB. Is this a matter of simply showing some commitment? Or is the Federal Government playing a significant role? In other words, is it just a matter of it being a player, or do they have to be a major player?

Mr. UHER. I think they have to be a major player.

Mr. KATZ. Part of the experience and one of the reasons I was pleased to have an opportunity to come back here and talk to the subcommittee is that, we have been very frustrated at the commission level in trying to get greater American participation. Part of this apparently is the perception that because Mag-Lev communicated early with some of the folks in Nevada, that their involvement was a foregone conclusion. Mag-Lev was perceived to be the technology so the American companies backed off. We have been struggling to overcome that perception, because I would like to see, when we go to RFPs later this year, a very competitive process and my druthers would obviously be if an American firm was participating, to the extent that participation would weigh heavily on our decision on who gets that franchise.

Senator ROBB. There was some testimony on the fact that this particular mode of transportation could be used perhaps initially

and in other ways to facilitate urban center transportation to regional airports. Has there been any discussion with the airlines or other transportation providers about providing an intermodal system that would in effect have the same hubbing capabilities that the airlines are using today, as a complement to that system? So that the two could be entirely compatible?

Mr. KATZ. There has been some initial discussion. That may be an area where I think the Federal Government could play a key role in helping to facilitate, that is, a different way for the airline industry to do business than they are doing business today. I believe congressional leadership would be a big help in making this occur.

Mr. REISTRUP. Senator, Mr. Colodny, the chairman of U.S. Air, has recently expressed interest in high speed rail, filling this type of role; those were in the series of panels and so forth that had been going on in the development of Secretary Skinner's transportation policy. Another fascinating thing to me is that CSX, the company that owns the largest coal carrier in this country, now has put money into high speed. The parent company has, not the railroad. So there is interest. The panel should know that there is such a rail feeder in Europe. Lufthansa has a chartered train that actually runs as a hub to feed its overseas flights at Frankfurt.

Senator ROBB. Let me just ask one final question, unless other members of the subcommittee appear in the next couple of minutes, with respect to the time frame for achieving profitability; almost any start-up has a period of time where it is not profitable, to say the least, and requires either significant financial backing from the private sector, or, more often than not, some period of time for government subsidies, if that is to be the case.

If you exclude participation of government funding in the equation, if you had to do this entirely within the limits of the resources that are available in the private sector, on any of the applications, what would be the standard period of time that you would expect to elapse, before you could start to turn a profit on a given system? And I realize that is a very general question. But given the technology and the costs and what have you, is there any sense of how long it takes to become profitable?

Mr. REISTRUP. Having been, Senator, in a number of these studies before I took over the Monongahela railway, including Pennsylvania, the Nevada-California, and also Florida, I would say about 10 years from the time that the construction would get started, assuming that a fast start-up, and also assuming that some trains would be running early on, that you would not wait to run trains until the whole project is finished. You might start 100 miles of the 300 to begin generating some revenue.

Mr. KATZ. Senator, it is hard to give a definite time. The time frame sounds reasonable. We expect that in the year 2000, from fare box alone, to be generating close to \$600 million annually on the Nevada-California run. Our ability to make it financially viable will depend, to a large extent, on the development agreements the joint ventures can put together at station locations along the routes.

Senator ROBB. Thank you. We have been joined by Senator Burns. Senator Burns we were just finishing up with some of the

questioning. But before we thank the panel, are there any questions you might like to propose, or anything you would like to say at this time?

Senator BURNS. Thank you, Mr. Chairman. We are involved in an alternative fuels discussion over in energy, and regulatory flexibility and small business. I have not caught the flow of the conversation here, so I think I would be out of line. But I think, I have a feeling, if we just build wider highways, we would just sell more cars, and they will be full. So I am very interested in rapid rail, and what it can do for moving people in this country. All we have to do is move from Montana to Washington, D.C. or New York or someplace like that, and you all at once find out that you have got different problems here than we have got out there.

I would certainly like to be a part of the solution to moving those people in the most economical way that we can, and as safe as we can, and as rapidly as we can.

So, thank you very much, Mr. Chairman.

Senator ROBB. Thank you, Senator Burns. As one who has benefited from the Montana perspective on a number of equations, it is always a refreshing change of a pace for those of us who spend most of our time on the east coast and do not always appreciate the special challenge they have.

Mr. Reistrup, Mr. Katz, Mr. Uher, we thank you very much for your participation. There may be additional questions that members of the subcommittee or staff might like to propose and they will do so in writing. If you would be kind enough to respond to those.

For taking the time to appear this morning, we thank you. I am not aware, unless committee staff have others, that we have others prepared to appear this morning. So if there are no other witnesses to testify, we thank all of you for coming, and this hearing is adjourned.

[Whereupon, at 10:05 a.m., the subcommittee adjourned.]

[The following information was subsequently received for the record:]

STATEMENT OF ERVON R. KOENIG, VICE PRESIDENT, BECHTEL CIVIL COMPANY

Mr. Chairman and members of the Committee:

Bechtel Civil Company, a unit of the Bechtel Group of Companies, is pleased to submit it's written testimony on the role of Magnetic Levitation technology in high speed inter-city transportation systems. We applaud the committee's interest and efforts in focussing public attention through the October 17th hearing on the benefits and advantages of utilizing advanced transportation technologies. We believe that advanced transportation technologies, especially magnetic levitation, are more than Disneyland-type attractions but in reality are already commercially viable and competitive.

Bechtel has been active in surface transportation system development, engineering and construction for over 90 years, since our founder started building railroads in the Oklahoma Territory. Since then we have been involved in 13 modern urban transit systems, more than 2,200 miles of railroads, over 7,000 miles of highways, and more than 50 large bridges. The company has been involved in virtually every new transit project in the

United States including the Washington Metro Rail, Boston Rapid Transit, San Diego Light Rail, Banfield Light Rail, and the Atlanta, San Francisco, Baltimore and Los Angeles Rapid Transit systems. Our experience in rapid transit systems has not been limited to domestic projects, but also includes key international systems in Sao Paulo, Caracas and Taipei.

Future prospects in transit, railroads and highways all look promising, both for domestic and international projects. One of the most exciting inter-city connector prospects is the proposed Las Vegas/Southern California Super-Speed Ground Transportation System (SSGTS). The comprehensive studies completed to date verify that the SSGTS project would be a financially feasible, fast, environmentally positive element in the future development of the Las Vegas/Southern California intercity travel corridor. Studies indicate that super-speed systems are not only technologically feasible but economically viable.

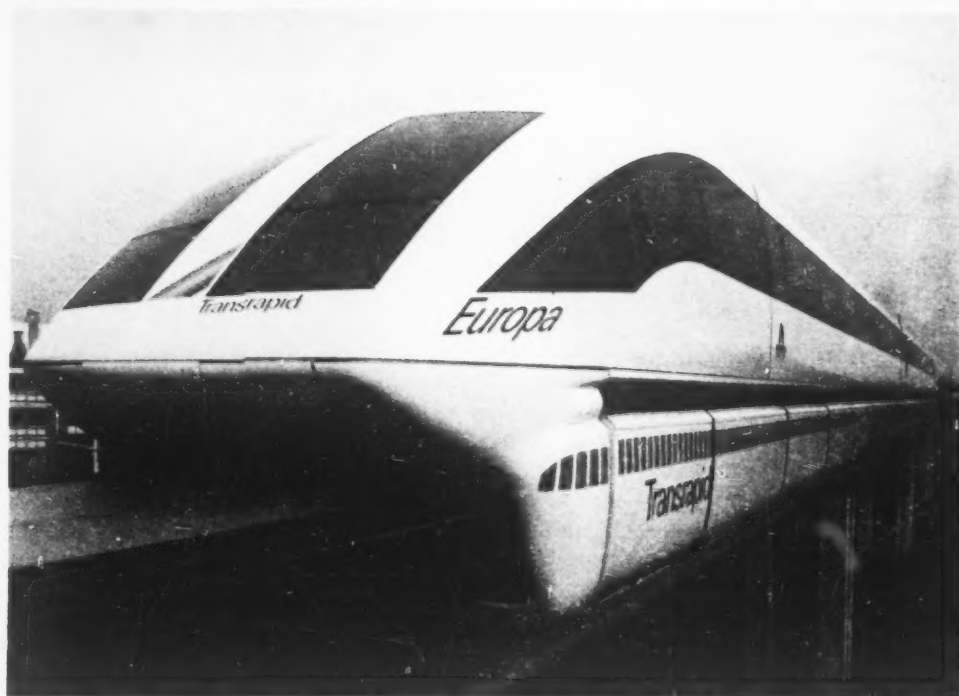
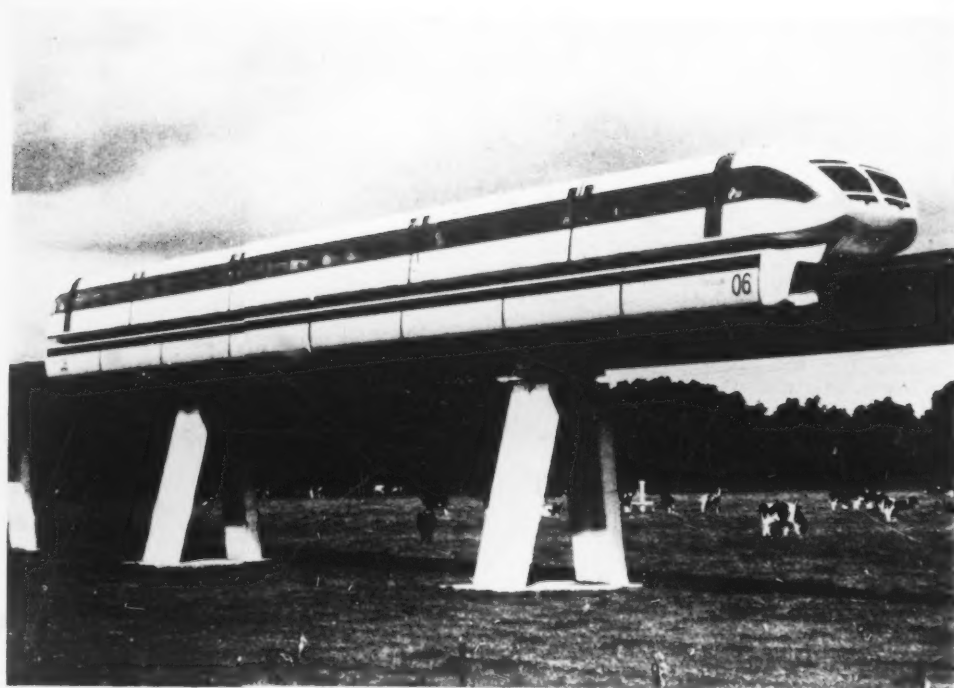
Four super-speed train technologies have been seriously evaluated. The assessment has resulted in two technologies being considered for near-term application to the Las Vegas/Southern California corridor: the German Transrapid MagLev and a second generation French TGV-Atlantique train (if specifically tailored for the corridor). Bechtel has entered into an agreement with Transrapid International of West Germany to utilize the super-speed MagLev technology in competing for the Las Vegas/Southern

California franchise to design, build and operated the system. Attached to our written testimony is a recent paper titled: "The Transrapid MagLev System", written by Mr. William Dickhart, III, a consultant to Transrapid International, for the Society of Automotive Engineers Future Transportation Technology Conference in August 1989. The paper discusses the status of the Transrapid Maglev system and its availability for commercial service and revenue application. Bechtel is enthusiastic about the potential for MagLev technology in high speed transportation applications and believes that any national transportation strategy must consider the merits of integrating super-speed rail as a crucial element of an inter-modal system.

There is currently much excitement about MagLev technology and it's application to national transportation needs. However, a number of issues concerning implementation and utilization need to be addressed by Congress, Federal and State regulators and other public authorities. For example, to be competitive with current transportation modes and to provide service with minimal impact on the environment, high-speed rail needs to take advantage of existing rail and inter-state right of ways. Also the Federal government, through the Federal Railroad Administration, must establish effective safety and technical standards that address the unique character of MagLev systems. This process is underway and we are encouraged that the new Federal Railroad Administrator and the Secretary of

Transportation have both shown high levels of interest in the potential for near term application of MagLev technology in the United States.

In conclusion, we believe that MagLev transportation technology is a viable, cost-effective system with unique safety, environmental and energy saving attributes that cannot be ignored but rather endorsed and encouraged by public policy. Firms such as Bechtel and Transrapid are committed to develop MagLev transportation as basically privatized ventures with a minimum of Federal or State funding but may require modification of existing rules or even new legislation to allow these systems to compete fairly with current technology. The potential for MagLev to relieve airport and highway congestion and effectively increase national transportation capacity is obvious, and we, along with our partner Transrapid, look forward to assisting the committee in determining the role of Congress in establishing MagLev super-speed ground transportation systems in the United States.



STATEMENT OF L.D. McFATHER, PRESIDENT, BROTHERHOOD OF LOCOMOTIVE ENGINEERS

Mr. Chairman and Members of the Subcommittee, I am Larry D. McFather, President of the Brotherhood of Locomotive Engineers. The Brotherhood of Locomotive Engineers appreciates the opportunity to appear before you today to present the Brotherhood's views concerning the importance of high speed rail and Magnetic Levitation trains in this country.

Historically, Locomotive Engineers are a highly productive craft charged with the responsibility of hauling the nation's freight and passengers. Like the railroads, they have helped formed the backbone of this country's transportation system. They have helped provide the link between the cities, states and regions of this country. They have helped provide business and industries the opportunity to expand far beyond their borders and have kept the economies of this nation going.

What has led to the demise of the rail passenger system in this country was the encouragement of the federal government to grant subsidies to competing modes of transportation, either directly or indirectly, thus leaving the railroad passenger system to flounder on its own.

The great success of highway and airline travel has created new problems. Growth has led to increasing traffic congestion, inefficiency, tremendous energy consumptions and deteriorations of many of our urban and suburban areas. Last year, Americans operated over 181 million cars, trucks and buses. They travelled over 1.9 trillion miles and put greater demands on our highway systems, airports and airlines. It has been said that 42% of the highway bridges in this country are in need of major repairs. In addition, it has been estimated that providing the costs for new facilities and repairing existing infrastructures, will cost this country's taxpayers close to three trillion dollars.

One way to reduce these costs is the use of high speed and Magnetic Levitation trains. The Federal Highway Administration has estimated that the cost of a mile of new expressway in 1985 dollars is \$43 million, in urban areas and \$11 million in the countryside.

By comparison, high speed rail can be built for between \$10 million and \$19 million per mile. The advantage is that rail lines have far greater passenger carrying capacity on a far smaller volume of land. In addition, rights-of-way for advanced rail lines

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already exist in most areas on underused or abandoned conventional rail properties, making expensive and time-consuming eminent domain proceedings unnecessary. In addition, the use of land along Interstate highway systems offers potential routes for future Magnetic Levitation trains at no cost to the taxpayer.

Maglev and high speed trains require about fifty-feet of right-of-way which can carry the volume of ten lanes of full speed highway traffic and serve a region twenty-five times larger in area. These trains are pollution-free and do not pollute the air such as the automobile or airplane.

Airline traffic delays are costly to both the airlines and the travelers. The FAA calculated that in 1985, air traffic delays cost major airlines \$1.8 billion or 7% of their total direct costs. In addition, these delays cost passengers an additional \$1.1 billion in lost time, exclusive of any higher fares that were paid because of increasing airline costs. By 1986, these delay costs climbed to nearly \$5 billion.

Much of the delay occurs at the nation's major airports. Eleven airports already have more than three million hours of passenger delays annually. Chicago's O'Hara Airport, the nation's busiest, has had more than 12 million hours of passenger delays per year. By 1996, it is estimated that 22 airports are expected to exceed three million hours of passenger delays annually.

Despite these dramatic increases in airport, airway and highway congestion, U.S. transportation authorities still continue to ignore the potential of European or Japanese type high speed rail electrified passenger trains. Two new developments suggest that the time is at last ripe for high speed rail's debut in the United States.

The "New York Times", in a front-page story last year, disclosed that the French National Railroad's TGV (very high speed) route between Paris and Lyons, has been earning substantial profits. In 1988, the Paris-Lyons line carried 17 million passengers and earned more than \$100 million on \$681 million in revenues. Opened in 1981 at a cost of \$2 billion, it is expected to pay off its infrastructure costs in ten years instead of the originally projected fifteen.

Why is the French TGV high speed train so profitable?

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Like all successful consumer products and services, they earn large profits by giving the public what it wants. In France, the intercity passenger transportation business means 'high speed'. The 270-miles between Paris-Lyons takes only two hours and the train cruises at 168 mph. New models now in operation can do 186 mph. Frequent departures, comfort, economy and reliability, all add up to making the line a profitable one.

In summary, over the next ten years, with our present transportation system, the U.S. transport bill will be at least \$12,000 billion in 1989 dollars, and probably considerably more due to increasing demand and fuel costs. Large-scale implementation of Maglev could save significant portions of these expenditures.

Monies to construct high speed and Maglev systems could come from both public and private sectors. Private financing could come from the sale of franchises for real estate development related to the high speed systems. Another favorable development occurred in the 100th Congress when a bill proposed by Senator Lawton Chiles (D-FL), passed, granting private-sector developers of high speed rail projects the authority to use taxfree 'industrial revenue' bonds to finance their systems. Together, these two developments have overcome the largest objections that have historically hindered the development of advanced railroad passenger technology in this country.

Therefore, the Brotherhood of Locomotive Engineers strongly supports the Maglev Technology Advisory Committee's recommendations:

1. Begin immediately an education campaign to explain the issues and options to the public, academia, government and industry.
2. Adopt the goal of constructing full-scale test and demonstration systems suitable for integration with highways within five years.
3. Provide dedicated funding in the amount of \$750 million over a six to seven year period, for developing, testing, and demonstrating several prototypes of alternative Maglev technologies that meet U.S. requirements and suitable for installation along Interstate Highways.

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4. Appoint an agency to manage the project of comparing and down-selecting alternative systems and constructing full-scale tracks for the two most promising ones.
5. Pass federal legislation and encourage the passage of State-enabling legislation including tax incentives and measures, for dealing with problems of anti-trust laws, eminent domain and zoning laws.
6. Establish an administrative structure that will act to implement high speed and Maglev systems in the U.S., and establish and enforce quality and safety standards. This structure would come into effect six to seven years after the research and development period.

We consider it vital to the economic, industrial and environmental well-being of this country and to resume this country's lost leadership in transportation.

